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AN ANALYSIS OF THE IRON AND STEEL INDUSTRY IN ALBERTA

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled AN ANALYSIS OF THE IRON AND STEEL INDUSTRY IN ALBERTA submitted by Frederick Harold Telmer in partial fulfilment of the requirements for the degree of Master of Arts.

ABSTRACT

This thesis endeavours to determine the feasibility of establishing an integrated iron and steel industry in Alberta. It is the contention of the thesis that the decision to establish such an industry must be based upon the existence of a market capable of absorbing the output of the industry.

The first part of the thesis is devoted to an examination of the existing production facilities and the consumption patterns for steel within the region. By comparing the output of these facilities with the consumption patterns, it was possible to derive the type and quantity of steel products being imported into the region. These imports provide the limitations for the size of the industry as they indicate what output could be absorbed.

In deciding whether this size of industry was feasible, it was necessary to ascertain what the competitive position of the industry would be. This involved examining the effect of the freight rate structure so as to determine what margin the local producer would have over the Eastern steel mills. The input costs were also examined, the major concern being with iron ore and scrap steel. The results of this examination showed that the quantity of scrap steel is limited and therefore cannot provide the basis for expansion. There also does not appear to be a suitable source of iron ore at this time.

The conclusions of the feasibility study indicate that all of the conditions required for the establishment of an integrated iron and steel industry in Alberta are fulfilled except for the availability of a suitable raw material source. The future of the industry is not contingent upon the market, but rather, it is contingent upon the development of a suitable raw material source.

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CHAPTER I

INTRODUCTION

The recent publicity concerning the iron ore deposits in the Clear Hills area of Northern Alberta has created considerable optimism regarding the benefits that may accrue to the province as the result of the installation of an integrated iron and steel industry.[1] Much of this optimism is based on the belief that a steel industry provides the foundation upon which an industrial complex is built. This belief is exemplified by the phrase "industry follows steel"; however, there is also a school of thought which prefers to reverse the phrase and have it read "steel follows industry".

Before an examination of the prospects for the establishment of an integrated iron and steel industry can be undertaken, the question of whether "industry follows steel" or "steel follows industry" must be resolved. Chapter II answers the question by examining the effects of establishing such an industry in a developed region like Alberta.

The purpose of the thesis, therefore, is to investigate the feasibility of an integrated iron and steel industry in Alberta to serve the Western Canadian market.

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[1]An integrated iron and steel industry is one which produces steel products; that is, final products from iron ore.

Chapter III sets the stage for the feasibility study by examining the existing production facilities in the Prairies. These existing facilities would serve as a base upon which to expand the industry into a fully integrated one.

The major step that must be taken is a detailed examination of the existing markets, which is undertaken in Chapter IV. The importance of this step is shown by the following statements:

> What is normally done is to investigate the market requirements and, from this, determine the tonnage of steel or hot metal which is required to satisfy this market. This tonnage is then used as the basis for a feasibility study.[2]

> Briefly stated, it is the authors' contention that the prime consideration in building an integrated steel works must be placed on a detailed analysis of consumption and future requirements of steel rolling mill products. . . . Once the factors for development or growth of a steel facility on a steel-product-market basis have been considered as favourable, then attention can be directed to the source of iron ore and other basic iron-and-steel-making materials for the steel plant in the market area chosen.[3]

Once the consumption patterns for steel products in the region have been derived, then the tonnage which an integrated industry could hope to supply can be calculated. In conjunction with this calculation, the pricing policies and freight rate structure will be examined in Chapter V so

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[2]Letter from, John W. Donaldson, Chief Metallurgist, Strategic-Udy Metallurgy, Ltd., May 2, 1963.

[3]T. H. Janes and R. B. Elver, "The Steel Industry of the Prairie Provinces," Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1963, p. 2. (Mimeographed.)

as to show the relative advantage which a local industry would enjoy. This latter examination will also serve to illustrate the limitations of the size of the market which the industry could hope to supply.

Chapter VI will examine the availability of raw materials which would be required by an integrated industry. The examination will involve not only the availability of a suitable iron ore source, but will also consider the limitations inherent in the steel scrap market in the region.

The final chapter will draw upon the conclusions of the preceeding chapters so as to decide if it is feasible to establish an integrated iron and steel industry in Alberta at the present time.

CHAPTER II

AN EXAMINATION OF THE EFFECTS OF ESTABLISHING A PRIMARY IRON AND STEEL INDUSTRY

The purpose of this chapter is to answer the question of whether industry follows steel or steel follows industry. This actually involves determining whether the establishment of a basic industry, such as iron and steel, will create its own market or will be dependent upon the existence of a market sufficiently large to absorb the output. This examination involves the iron and steel industry but the approach applies equally well to any other basic industry.

The effects of establishing the industry in an underdeveloped region, that is, one in which underemployment exists and where the marginal productivity of labour is very close to zero, and a developed region, such as Alberta, in which there is not a substantial amount of idle resources present, will be examined. By looking at these two cases, it will be found that industry follows steel in an underdeveloped region but in a developed region, such as Alberta, steel follows industry.

It is assumed that the establishment of the industry in the underdeveloped region would be under the direction of the public sector, whereas the industry in the developed

region would be established by the private sector.

In an underdeveloped region, that is, where the economy is characterized by a standard of living close to the subsistence level, the establishment of a basic industry, such as primary iron and steel, can bestow substantial benefits upon the region in the form of an increased standard of living. The standard of living is increased by employing resources which had been idle or which were unproductive beforehand. This would probably involve transferring labour from the subsistence sector and employing them in the basic industry. In that their marginal productivity was very close to zero beforehand, the transfer to the basic industry should result in increased productivity.

This is the first basic difference between the underdeveloped and developed regions in that substantial underemployment is not likely to exist in the developed region. This means that the aggregate costs to the economy in the developed region would probably be higher in that idle resources could not be employed; therefore, other forms of production would have to be sacrificed.

The raising of the standard of living in the economy of the underdeveloped region is of considerable benefit. In view of the benefits obtained, the government of the region could justify the expenditure on the establishment of a basic industry. If such an industry were to incur losses during the early stages of operation, then these losses could be absorbed by the government as the loss would probably be

offset by the increase in the standard of living accruing to the economy as a whole. In a region such as Alberta, however, the pattern of resources relative to the demand is such that the profitability of private investment has produced relatively full employment. The private sector has developed to the point where it will seek out profitable ventures; therefore the government does not have to assume the role of the entrepreneur.

Additional benefits may accrue to both the underdeveloped and developed regions as the output of the industry can be used to replace goods which are currently being imported. This transfer could offset a portion of the costs of importing the capital equipment. If either of the regions were a separate country, then the import replacement could lessen the burden on the country's foreign exchange position. In either case, the practice of import replacement will tend to minimize leakages from the region involved and therefore will tend to increase the employment effects that may result from the establishment of a basic industry.

The practice of import replacement is more likely to be successful in the underdeveloped region as the presence of governmental direction would make the practice much more effective. The way in which a government could assure the effectiveness of the program would be to impose tariffs, restrictive quotas, and also, they could provide incentives to the local industries through tax concessions. The above methods of implementing an import replacement program could not be undertaken by a private industry.

It is evident that the establishment of a basic industry in an underdeveloped region could bestow substantial benefits upon the region, providing the assumptions hold true. It has been shown that the expenditure necessary to establish the industry could be justified in view of the increase in the standard of living which will accrue to the economy of the region. This is the basis for the assumption that a government would undertake such a venture. Private investment is not likely to undertake such a project for the benefits would accrue to the economy as a whole, and not necessarily to the private investors.

In the case of the developed region, it is assumed that the government would not undertake the establishment of an industry as there is not likely to be substantial benefits accruing to the economy as a whole; that is, a raising of the overall standard of living. Therefore it is unlikely that they could justify the necessary expenditure. Consequently, the establishment of the industry in a developed region would have to be undertaken with private funds.

What then provides the primary justification for establishing a primary iron and steel industry in a developed region, such as Alberta? The answer to this question lies in the reverse of the phrase mentioned earlier; "steel follows industry". This means that the justification for the establishment of the industry is the existence of a market capable of absorbing the output produced. In other words, the existence of an adequate market provides the

industry with the prospect of making a profit. The profit aspect would have to be present before private investment could be expected to finance the industry.

In a recent study concerning the prospects of the iron and steel industry in Western Canada, the importance of the market was emphasized by the statement:

> It might be noted that for many years the main consideration in steel industry location and growth in any country or area has been markets rather than resources; steelmaking and rolling facilities are, for the most part, market-oriented and not resource-oriented.[1]

The preference towards market orientation as opposed to resource orientation is a recent development; that is, within the past twenty or thirty years. The reason for this preference is probably the fact that industrial complexes have developed, therefore a new industry would be in a better position to supply the market if it were located within the market. In addition to this, is the fact that the services which a basic industry requires are already well established within the market area. It is difficult to illustrate the importance of market orientation in Canada[2] as there are only four major steel producers. However, the plants which are located in the Ontario market have been more successful in terms of diversification and growth than

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[1]T. H. Janes and R. B. Elver, "The Steel Industry of the Prairie Provinces," Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1963, p. 2. (Mimeographed.)

[2]For a general picture of the Canadian iron and steel industry see: Lucy Morgan, The Canadian Primary Iron and Steel Industry (Ottawa, Royal Commission on Canada's Economic Prospects, October, 1956) pp. 83-4.

the plant located in the Maritimes.[3]

The Ontario plants have expanded considerably in recent years and have provided the basis for considerable secondary development,[4] whereas the plant located in the Maritimes, which is resource-oriented, has not expanded appreciably due to the lack of markets. This is borne out by a recent statement made by a spokesman of the Steel Company of Canada, Limited, where he states:

> In that the materials for steel making can be moved fairly cheaply in bulk volumes while finished steel items require expensive and careful handling, it is understandable that the more successful steel enterprises are located as close as possible to the centres of their consuming markets.[5]

In conclusion, it can be stated that the establishment of a primary iron and steel industry in a developed region such as Alberta must be based upon the existence of a suitable market; an examination of the prospects of such an industry must necessarily entail an examination of the adequacy of the market.

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[3]The Ontario plants are: The Steel Company of Canada, Limited, located in Hamilton; Dominion Foundries and Steel, Limited, in Hamilton; and the Algoma Steel Corporation, Limited, located in Sault Ste. Marie. The Maritime plant is the Dominion Steel and Coal Corporation which is located in Sydney, Nova Scotia.

[4]An example of this is the location of the plant of the International Harvester Co. of Canada, Ltd., which is located adjacent to the Hamilton Works of the Steel Company of Canada, Limited.

[5]M. W. Farrell, "The Canadian Steel Industry since 1956," Paper presented in the Stelco Management Bulletin, January, 1964, p. 9. (Mimeographed.)

CHAPTER III

A DESCRIPTION OF THE PRESENT STEEL-MAKING FACILITIES IN THE PRAIRIES

The steel industry in the Prairies is at present wholly dependent upon steel scrap as its basic raw material. The industry cannot be considered to be integrated as, in terms of the definition[1] established in Chapter I, it does not use iron ore as the basic raw material.

The greater portion of the production within the Prairies is confined to low value-per-unit-of-weight type of products. These products are mainly in the form of merchant bar products[2] and some of the lighter structurals.

There are three plants producing steel within the Prairie Provinces; one being located in each of the three provinces. Their combined capacity in 1961 totalled 330,000 tons per year. Their actual production on the other hand, has ranged from 51,000 tons in 1954 to 196,000 tons in 1961.[3]

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[1]Above, p. 1, n. 1.

[2]Merchant bar products are small diameter bars with little or no alloying materials present. The most common example is reinforcing bar.

[3]See Table 2. It should be noted that in the period 1954 to 1961, both Premier Steel Mills, Ltd. and Interprovincial Steel and Pipe Corporation Ltd. came into existence.

Most of the melting is done through the use of electricity for heat rather than by using coke or natural gas. The reason for this is that the electric furnace is more adaptable to a smaller scale of operation, whereas the conventional steel-making furnace, the open hearth, is no longer economical for producing small heats.[4] The reason for the swing away from open-hearth furnaces for small heats is that an open hearth, in order to be as economical as possible, must use hot metal. This means having a large blast furnace installation which would produce about 2,000 tons of hot metal per day; the blast furnace is the governing factor making small open-hearth furnaces impractical.

In addition to the basic steel-making facilities, the three Prairie producers have their own rolling-mill facilities. A more detailed discussion of these facilities is included in the following description of each of the three companies.

Manitoba Rolling Mill Company, Limited is located in Selkirk, Manitoba. The company uses two basic open-hearth furnaces which have a combined annual capacity of 48,000 tons.[5] In addition to these furnaces, the company also

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[4]The trend has been towards very large installations such as the 500-ton open-hearth recently installed by the Steel Company of Canada, Limited at their Hamilton plant. The smaller producer on the Prairies cannot hope to attain this level of production. Consequently, an electric furnace of about fifteen-ton capacity is better suited to the needs of the small producer.

[5]These open hearth furnaces were previously used in earlier steel mills in Alberta. They were shipped to Manitoba after the Alberta Mills ceased operations due to lack of business following World War I. These furnaces are not as efficient as the electric units in that they do not use hot metal.

possesses two electric furnaces having a combined annual capacity of 60,000 tons. The company's rolling mill facilities consists of two roughing mills and five light finishing mills.[6] The company's production is limited to merchant bar products, such as reinforcing bar, flats, rounds, et cetera. Production averages about 70,000 tons annually.

Interprovincial Steel and Pipe Corporation Ltd., (IPSCO) is located near Regina. The company uses two thirty-two ton electric steelmaking furnaces with a combined capacity of 125,000 tons per year. The rolling mill facilities consists of one combination plate and slabbing mill, and one reversing hot-strip mill. The company can produce steel plate, skelp and hot-rolled sheets up to 114 inches in width. The company also has a pipe producing division which was formerly Prairie Pipe Manufacturing Co. Ltd.[7]

Premier Steel Mills Ltd. has its manufacturing facilities in Edmonton. The company uses two fifteen-ton electric furnaces with a combined capacity of 100,000 tons per year. In addition, the company installed a two-strand

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[6] The conversion of steel into finished products involves passing the steel between rolls so as to squeeze the steel into the desired shape. The term roughing mill describes the first set of rolls which rough out the approximate shape of the finished product. The term finishing mill describes the rolls which finish the shaping of the steel.

[7] IPSCO was formed by the merger of Prairies Pipe Manufacturing Co., Ltd., and Interprovincial Steel Corporation Ltd. in 1960.

continuous-casting machine[8] in 1962; the second one to be installed in North America. The company operates a sixteen-inch roughing mill and five stands of twelve-inch finishing mill for rolling purposes.[9] In addition to the primary steel-making function, the company also produces a wide range of finished steel products, many of which are for the oil industry. In 1962, Premier Steel was purchased by the Steel Company of Canada, Limited.

In addition to the steel producing companies, there are also several pipe manufacturers located in the Prairies with a combined capacity, as of the end of 1962, of 955,000 tons annually. Although specific operating rates are not available for these plants, it has been estimated that the western producers have been operating at between twenty-five and forty per cent of their capacity.[10] It should be noted that 775,000 of the total 955,000 tons of pipe capacity is located in Alberta. The dominant producer in the Prairies, Camrose Tubes, Limited, has an annual capacity of 325,000

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[8]A continuous casting machine eliminates the need for pouring steel into ingot moulds. The process produces a continuous billet which is cut into appropriate lengths for rolling.

[9]Premier Steel Mills Ltd. has been in operation since 1955; consequently, it is difficult to estimate an average level of production as the output has been increasing each year. However, a production figure of 75,000 tons per year would be a reasonable estimate.

[10]Janes and Elver, <u>op. cit</u>., p. 33. The primary reason for the low portion of total capacity being used is that pipe production, especially the larger sizes, tends to fluctuate quite widely, therefore additional capacity must be present to meet the peak periods.

tons to which additional facilities for producing the smaller sizes of pipe are being considered which would increase the total capacity of the plant to 450,000 tons annually.[11]

It is significant to note, at this point, that Camrose Tubes is owned jointly by Page Hersey Tubes, Limited and the Steel Company of Canada, Limited, thereby providing a link between Premier Steel Mills and Camrose Tubes. This, as will be shown later, could provide the key to the establishment of an integrated iron and steel facility in Alberta.

The above description indicates the type and capacity of the present production facilities located in the Prairies. The next chapter will turn to an analysis of the market for steel in the Prairies. By comparing the capacities of the present production facilities and the quantities of steel being consumed in the Prairies, it will be possible to show what areas of consumption may provide justification for expansion of the present facilities.

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[11] Camrose Tubes' present production range is from sixteen inches to forty-two inches. The addition will enable them to produce pipe in diameters from one-half to forty-two inches.

CHAPTER IV

CONSUMPTION PATTERNS FOR STEEL IN THE PRAIRIE PROVINCES

A. Introduction

The purpose of this chapter is to analyze the market requirements for steel products in the Prairies. From this analysis, it will be possible to estimate the tonnage of steel that an integrated iron and steel industry could hope to produce. This tonnage, together with an analysis of freight charges and other costs, will serve as the basis for a profitability study to determine whether or not such an industry could be established in the Province of Alberta.

The present size and structure of the industry, as it exists in the Prairies, has been described in Chapter III; by utilizing the size and total capacity limitations it will be possible to estimate what proportion of the rolling mill products being consumed within the region are produced locally. The necessity for estimating this proportion is that the statistics concerning the consumption of these products do not differentiate between products produced in the Prairies and products produced in Canada as a whole. The only distinction which is made is between domestically produced products; that is, products produced in Canada,

and products imported from foreign sources. A further reason for the above estimate is that the tonnage figure will be closely associated with the tonnage of steel being imported into the region.

From the analysis, it will become apparent that the major area of growth in the consumption of steel products in recent years has been in the provision of steel for the oil and gas industry. Many people believe that this market provides the only justification at the present time for the establishment of a fully integrated iron and steel industry in Western Canada. In view of this supposition, a more detailed analysis of the consumption patterns in this section of the market will be undertaken.

The final section of this chapter will examine recent projections concerning steel consumption in the Prairies. This examination is especially important as any facilities which are constructed must be designed to accommodate the future requirements as well as those of the present.

Before discussing the actual consumption patterns, it is necessary to describe some of the problems associated with the availability of statistics for this particular topic. This description will indicate why a generalized approach was used in some areas of the analysis.

The basic problem which was encountered was not a lack of statistics and related material concerning the consumption of steel products in the Prairies, but the absence of a detailed breakdown of the statistics. It is evident

that the primary reason for the lack of a detailed breakdown is the existence of the disclosure rule of the Dominion Bureau of Statistics; some of the breakdowns illustrating various consumption patterns would reveal information concerning individual firms. This is especially true of the production figures for the individual provinces. A secondary factor contributing to the lack of detail could be the fact that such a detailed breakdown is not in great demand, therefore figures are grouped so as to give an overall picture only.

The majority of the data used did not come from Dominion Bureau of Statistics pulications as most of these publications are concerned with the overall picture. It was necessary to use information provided in special studies carried out by various government departments but derived from the worksheets of the Dominion Bureau of Statistics. The disadvantages encountered here are that these studies are not issued on a regular basis and, because of the reasons outlined above, they also do not provide a sufficiently detailed breakdown. Because of the lack of detailed information, it was necessary to devise estimates to arrive at a useable breakdown. An example of this is the breakdown of steel production originating with the Prairies, presented in Table 4.

The heavy reliance on the paper presented by Janes and Elver[1] is because this is the only recent disscussion

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[1]T. H. Janes and R. B. Elver, "The Steel Industry of the Prairie Provinces", Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1,1963, p. 13 (Mimeographed.)

on the steel industry in the Prairies. It should be made clear that the statistical material taken from this source can be considered reliable in that they have drawn their data from the worksheets of the Dominion Bureau of Statistics.

B. Consumption Patterns for Steel Products by Major Classifications

The method that will be used to analyze the consumption patterns is to employ the classifications that the Dominion Bureau of Statistics have established for reporting consumption of steel products in Canada.[2] As was mentioned earlier, the main concern is with rolling mill products because these are the major users of steel production. Such products also indicate the facilities that are necessary for their production. The breakdown of these rolling mill products is as follows:

(1) Structurals: Steel which is used for construction purposes. The more common types are angles, beams and channels.

(2) Plates: Pieces of steel which are one-quarter inch or thicker and are over six inches in width. When the steel is wider than forty-eight inches, then the minimum thickness is three-sixteenths of an inch.

(3) Skelp: Steel strip or plate from which pipes or tubes are made by a welding process.

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[2]Canada, Department of Trade and Commerce, "Apparent Consumption of Steel Rolling Mill Products in Canada by Region, 1956 to 1960", Ottawa, September, 1961. (Mimeographed.) This study was compiled from the Dominion Bureau of Statistics' study, "Primary Iron and Steel".

(4) Rails: Steel which is rolled into the shape of common railway track.

(5) Track Material: The various products which are used in the laying of railway tracks such as tri-plates, track spikes and track bolts.

(6) Bars: A length of steel having a uniform cross section with a diameter from one-quarter inch up to eight inches. The bars may be round, square, hexagonal, etc.

(7) Sheet and Strip: Thin flat-rolled steel which is generally over twelve inches in width and is in a long continuous strip form or in sheets of limited length.

(8) All Other Forms: This classification includes all of the miscellaneous type of steel rolling mill products which are produced but which are not classified under the above sections.

The analysis will be concerned with the consumption of these categories in the years from 1956 to 1961 inclusive. The consumption statistics are split into two major divisions: products which are obtained from domestic sources, that is, from any producer in Canada; and products which are obtained from foreign sources, that is, from producers located outside Canada.

Table 1 indicates the quantities of steel rolling mill products, grouped by standard classifications, which have been consumed in the Prairies from 1956 to 1961. It can be seen from the table how the total quantity of steel consumed has fluctuated over the years. There is one significant trend which emerges, namely, the steady decline of steel provided from foreign sources. This decline in foreign consumption is offset by the increase in domestic production. However, it is not known whether this increased production

is being undertaken in the Prairies or in Eastern Canada because the domestically produced portion includes steel from all the areas of Canada.

Table 1 also indicates a significant increase in the quantity of skelp consumed over the period. This, as will be discussed in a later section, is not as important as might appear in that the period under discussion was one in which large diameter pipelines were constructed in Western Canada.

TABLE 1

APPARENT CONSUMPTION OF STEEL ROLLING MILL PRODUCTS IN THE PRAIRIES, 1956 TO 1961 (TONS OF 2,000 POUNDS)

	1956		
Product	From Canadian Sources	From Foreign Sources	Total
Structurals	13,587	44,388	57,975
Plates	15,358	28,533	43,891
Skelp	3,267	3,795	7,062
Rails	53,256	303	53,559
Track Material	34,400	165	34,565
Bars	108,857	4,573	113,430
Sheet and Strip	53,584	26,106	79,690
All Other Forms	561	228	789
Total	282,870	108,091	390,961

TABLE 1--Continued

Product	1957		
	From Canadian Sources	From Foreign Sources	Total
Structurals	24,345	43,993	68,338
Plates	15,848	11,195	27,043
Skelp	46,387	29,510	75,897
Rails	63,817	199	64,016
Track Material	47,857	93	47,950
Bars	83,042	3,609	86,651
Sheet and Strip	41,877	13,068	54,945
All Other Forms	1,001	1,282	2,283
Total	324,174	102,949	427,123

Product	1958		
	From Canadian Sources	From Foreign Sources	Total
Structurals	19,883	35,461	55,344
Plates	9,718	18,347	28,065
Skelp	76,688	193	76,881
Rails	70,376	64	70,440
Track Material	20,980	80	21,060
Bars	84,197	1,095	85,292
Sheet and Strip	40,871	11,434	52,305
All Other Forms	1,977	1,523	3,500
Total	324,690	68,197	392,887

TABLE 1--Continued

Product	1959 From Canadian Sources	1959 From Foreign Sources	1959 Total
Structurals	31,849	29,871	61,720
Plates	25,186	6,208	31,394
Skelp	48,228	1,048	49,276
Rails	88,777	51	88,828
Track Material	42,662	99	42,761
Bars	111,952	976	112,928
Sheet and Strip	68,475	6,684	75,159
All Other Forms	4,791	342	5,133
Total	421,920	45,279	467,199

Product	1960 From Canadian Sources	1960 From Foreign Sources	1960 Total
Structurals	24,264	42,355	66,619
Plates	24,953	5,823	30,776
Skelp	57,259	2,442	59,701
Rails	58,769	-	58,769
Track Material	17,564	32	17,596
Bars	96,669	1,353	98,022
Sheet and Strip	54,400	5,401	59,801
All Other Forms	3,444	26	3,470
Total	337,322	57,432	394,754

TABLE 1--Continued

Product	1961 From Canadian Sources	1961 From Foreign Sources	1961 Total
Structurals	32,922	25,000	57,922
Plates	34,648	5,000	39,648
Skelp	130,020	5,000	135,020
Rails	62,011	-	62,011
Track Material	19,999	-	19,999
Bars	124,264	1,000	125,264
Sheet and Strip	52,050	6,000	58,050
All Other Forms	3,953	100	4,053
Total	459,867	42,100	501,967

SOURCE: Adapted from, Canada, Department of Trade and Commerce, "Apparent Consumption of Steel Rolling Mill Products in Canada by Region, 1956 to 1960", Ottawa, September, 1961. (Mimeographed.) The 1961 figures were taken from: T. H. Janes and R. B. Elver, "The Steel Industry of the Prairie Provinces", Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1963, p.13. (Mimeographed.)

What now must be done is to estimate the portion of the consumption that is produced in Western Canada. Although there is not a breakdown along these lines, a good approximation can be obtained by using the total steel output of the Prairie Provinces and by eliminating much of the consumption by reference to the limitations of the production facilities set out in Chapter III.

Table 2 shows the production of steel in the Prairie Provinces for the years 1954 to 1961. The table was derived from data which included steel castings as well as steel ingot production. Although there is no figure available regarding the tonnage of castings produced in Western Canada, it is possible to adjust the figures on a somewhat arbitrary basis so as to eliminate any distortion caused by the inclusion of these quantities.

TABLE 2

ANNUAL PRODUCTION OF STEEL IN THE PRAIRIE PROVINCES, 1954 TO 1961 (NET TONS)

Year	Manitoba	Saskatchewan	Alberta	Total
1954	50,912	-	676	51,588
1955	69,055	-	5,042	74,097
1956	98,056	-	31,945	130,001
1957	61,243	-	43,827	105,070
1958	53,921	-	36,046	89,967
1959	83,954	-	56,235	140,189
1960	55,936	21,985	68,378	147,299
1961	102,937	49,102	73,121	196,138

SOURCE: T. H. Janes and R. B. Elver, "The Steel Industry of the Prairie Provinces," Paper Presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1963, p. 13. (Mimeographed.)

The principal part of the production of castings is carried out in Manitoba where there is a relatively large installation for making cast steel railroad wheels. After a discussion with the Sales Manager of Premier Steel Mills, Ltd.,[3] it was decided that the best approximation would be to reduce Manitoba's output by 15,000 tons per year. The amount of castings produced in the other two provinces is insignificant; consequently, these production figures were left unaltered.

By taking the total consumption figures from Table 1 and subtracting the total tonnage produced as shown in Table 2,[4] it is possible to arrive at the quantities of steel rolling mill products which were imported into the Prairie Provinces for the years 1956 to 1961 inclusive. The results of this procedure are shown in Table 3.

To complete this section of the analysis, all that remains is to allocate the Prairie production figures into the standard classifications. It was mentioned earlier that such a breakdown is not available. However, it is possible to make the allocation on the basis of the limitations of the production facilities in the Prairies as outlined in Chapter III.

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[3]Personal interview with Mr. J. H. Brown, Sales Manager, Premier Steel Mills, Ltd., Edmonton, Alberta, May 15, 1963.

[4]For the sake of simplicity, it is assumed that one ingot of steel will produce one ton of steel rolling mill products. In actual fact, the yield may be about ninety-five per cent but at this stage of the thesis, it is only necessary to obtain an approximate figure.

TABLE 3

GEOGRAPHICAL SOURCES OF STEEL ROLLING MILL PRODUCTS CONSUMED BY THE PRAIRIE REGION FOR THE YEARS 1956 TO 1961
(NET TONS)

Year	From Other Canadian Sources	From Prairie Sources	From Foreign Sources	Total Regional Imports	Total Steel Consumed
1956	152,869	130,001	108,091	260,960	390,961
1957	219,104	105,070	102,949	322,053	427,123
1958	234,723	89,967	68,197	302,920	392,887
1959	281,731	140,189	45,279	327,010	467,199
1960	190,023	147,299	57,432	243,455	390,754
1961	263,729	196,138	42,100	305,829	501,967

SOURCE: Compiled from Tables 1 and 2.

In a further discussion with the Sales Manager of Premier Steel Mills, Ltd.,[5] a suitable procedure for the allocation was derived. Basically the procedure is as follows:

(1) Ten per cent of the structurals can be classified as light structurals and therefore can be produced on the Prairies.

(2) The Prairie facilities are capable of supplying one hundred per cent of their bar requirements.

(3) The remainder of the production (if any) would be in the form of track material.

(4) Saskatchewan's output in 1960 and 1961 would be in the form of skelp and, to a lesser extent, plates.

The above procedure has been applied to the data in Table 1 and Table 3, and the resulting allocation is shown in tabular form in Tables 4 and 5.

Table 5 indicates what quantities of steel rolling mill products are currently being imported into the Prairie Provinces. These figures are of central importance to the purpose of this thesis, since they indicate the market in Western Canada which could be supplied through local production.

There is no breakdown available of consumption by individual provinces; however, a reasonable estimate of the magnitudes involved can be obtained by using a simple ratio for dividing the consumption between the provinces. The ratio which was suggested for 1961 was 10.5 / 1.5 / 3.0 for Alberta, Saskatchewan, and Manitoba respectively.[6] This

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[5]J. H. Brown, <u>op. cit.</u>

[6]Janes and Elver, <u>op. cit.</u>, p. 13.

TABLE 4

ESTIMATED PRODUCTION OF STEEL ROLLING MILL PRODUCTS
BY STANDARD CLASSIFICATIONS IN THE PRAIRIE PROVINCES
FOR THE YEARS 1956 TO 1961 INCLUSIVE
(NET TONS)

Product	1956	1957	1958	1959	1960	1961
Structurals	5,798	6,834	5,534	6,172	11,645	5,792
Plates	-	-	-	-	6,985	9,102
Skelp	-	-	-	-	15,000	40,000
Rails	-	-	-	-	-	-
Track Material	15,346	15,194	3,782	22,065	17,000	16,980
Bars	108,857	83,042	80,651	111,952	96,669	124,264
Sheet and Strip	-	-	-	-	-	-
All Other Forms	-	-	-	-	-	-
Total	130,001	105,070	89,967	140,189	147,299	196,138

SOURCE: Compiled from Tables 1, 2, and 3.

TABLE 5

ESTIMATED IMPORTS OF STEEL ROLLING MILL PRODUCTS BY STANDARD CLASSIFICATIONS IN THE PRAIRIE PROVINCES FOR THE YEARS 1956 TO 1961 (NET TONS)

Product	1956	1957	1958	1959	1960	1961
Structurals	52,177	61,504	49,810	55,548	54,974	52,130
Plates	43,891	27,043	28,065	31,394	23,791	30,546
Skelp	7,062	75,897	76,881	49,276	44,701	95,020
Rails	53,559	64,016	70,440	88,828	58,769	62,011
Track Material	19,219	32,756	17,278	20,696	569	3,019
Bars	4,573	3,609	4,641	976	1,353	1,000
Sheet and Strip	76,690	54,305	52,305	75,159	59,801	58,050
All Other Forms	789	2,283	3,500	5,133	3,470	4,053
Total	260,690	322,053	302,920	327,010	247,455	305,829

SOURCE: Compiled from Tables 1 and 4.

ratio would appear to be reasonable in view of the predominance of the pipe producing facilities located in Alberta.

Up to this point in the discussion, the British Columbia market has not been considered as a potential outlet for an integrated steel facility located in Alberta. The reason for this omission is that British Columbia is extremely vulnerable to competition from Japan. It is virtually impossible for the Prairie producer to land his products in the British Columbia market at a price competitive with the Japanese price; the rail rates from the Prairies to the West Coast are higher than the shipping costs from the Japanese plants to Vancouver. The Japanese producers also enjoy advantages of large scale production which are not open to the Prairie producer. The existing steel industry in the Vancouver area manages to survive because it is producing low value per unit of weight types of products for distribution in the immediate area.

Now that the probable overall consumption patterns have been established for the region, the analysis will focus upon a particular section of the market; namely, the market provided by the oil and gas industry. As a preface to this next section, it would be useful to mention that the discussion thus far, has been concerned with rolling mill products or fabricated products which are imported into the region. This latter category would include such items as well casing, drill pipe, and some line pipe for oil and gas pipelines.

C. The Demand for Steel Products by the Oil and Gas Industry

> If an integrated steel facility is established on the Prairies, it will be established, primarily, to provide skelp and plate for pipe manufacture. Sheet and strip for other end-uses could be produced only in conjunction with skelp. A very large increase in secondary manufacturing would be required before the construction of an integrated steel plant on the Prairies to produce structurals and flat rolled products would be feasible.[7]

The above quotation typifies much of the current opinion concerning the establishment of an integrated iron and steel industry in the Prairies. The validity of the quotation can be illustrated by the large capital expenditures made by the Algoma Steel Corporation, Limited and The Steel Company of Canada, Limited. Both these companies have recently installed facilities capable of producing sufficient diversity of output to satisfy the major part of Eastern Canada's needs. Therefore, it is not feasible for the relatively small industry in Western Canada to consider establishing facilities capable of meeting the diverse needs of the Prairie region. A smaller specialized mill capable of supplying a specific need, in the case skelp, would be the only answer.

In view of the critical importance of skelp and related products in the future of the iron and steel industry in the Prairies, this market will be examined in detail to ascertain the present size, structure, and future prospects.

In the preceeding section, Table 1 shows that the consumption of steel rolling mill products in the Prairies

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[7] <u>Ibid</u>., p. ii

for 1960 was 394,754 tons, of which skelp and plate amounted to 90,477 tons. However, as Janes and Elver have shown, the total consumption of pipe consumed in the four western provinces in 1960 amounted to 327,989 tons, broken down as follows:

Transmission lines	202,894 tons
Distribution lines	22,746 tons
Gathering lines	30,349 tons
Well-casing pipe	92,000 tons
Total	327,989 tons[8]

These figures give some indication of the excess of total consumption over the consumption of steel rolling mill products which exists in the Western Canadian market.

It is difficult to separate the various diameters of pipe into those which are used in gathering lines, transmission lines, and distribution systems as there is considerable overlap in the various sizes used. Generally speaking, the transmission lines use much larger pipe than do either of the other two classifications.

The major purpose of this chapter is to determine the tonnage of steel which a local industry could hope to supply. Because of the problems associated with producing the larger sizes, an attempt will be made to indicate the general size ranges which make up the tonnage of skelp

[8] *Ibid.*

being consumed in the region. This breakdown will have a direct bearing on any discussion concerning the size of the industry likely to be set up.

Table 6 indicates the increase in pipeline mileage which has occurred since 1955. It should be mentioned that the natural gas pipeline mileage in Table 6 may be misleading as these figures include a substantial amount of distribution system mileage which has been installed to serve the residential needs of Canadian cities. However, the table does show the steady increase in pipeline installations on an overall basis which has occurred since 1955.

The major concern is with the breakdown of pipe consumption into the various sizes for purposes of analyzing the requirements of the proposed size of industry. Table 7 shows the breakdown in Canada for the years 1957 to 1961. Following this, two additional tables have been included; the first shows the weight per mile of various diameters of pipe, and also the width of skelp necessary to produce the various diameters. The second table, Table 9, shows the tonnage of pipe which was installed in the four western provinces in 1959 and 1960.

From these tables, it can be seen that approximately sixty-five per cent of the pipe used, by weight, is above fifteen inches in diameter. Of the remaining thirty-five per cent, it is estimated that only twenty per cent would be under seven inches in diameter. Consequently, in order to supply a significant amount of skelp to the market in

TABLE 6

OIL AND NATURAL GAS PIPELINE MILEAGE[a] IN CANADA,[b] 1955 TO 1961

Year	Oil	Natural Gas	Total
1955	5,079	8,063	13,142
1956	6,051	13,699	19,750
1957	6,853	21,458	28,311
1958	7,148	27,237	34,385
1959	7,945	30,410	38,355
1960	8,435	32,859	40,294
1961	9,548	35,640	45,188

[a]This table includes all forms of pipelines.

[b]Canadian figures are used here as the oil and gas production, which originates in the Prairies, moves out of the region. Therefore, pipeline mileage in the Prairies alone would not reveal the complete picture.

SOURCE: Taken from, T. H. Janes and R. B. Elver, "The Steel Industry of the Prairie Provinces", Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1963, pp. 18-19. (Mimeographed.)

TABLE 7

OIL AND GAS PIPELINE MILEAGE IN CANADA BY PIPE DIAMETER, 1957 TO 1961
(PIPE DIAMETER 'INSIDE' IN INCHES)

Year	0 - 5.9[a]	6 - 8.9	9 - 12.9	13 - 20.9	21+	Total
1957	12,162.0	5,015.5	3,896.0	2,971.9	3,457.6	27,503.0
1958	14,736.4	5,850.0	4,408.9	3,277.2	4,611.7	32,884.2
1959	17,116.1	6,528.4	4,078.7	3,393.7	4,751.5	35,868.4
1960	18,840.2	7,011.1	4,955.4	3,495.7	4,900.0	39,202.5
1961[b]	17,846.6	5,891.3	3,184.4	2,140.6	3,826.9	32,889.8

[a]The 0-5.9 range contains a large portion of distribution pipe.

[b]Breakdown on oil figures for 1961 not included.

SOURCE: Taken from, T. H. Janes and R. B. Elver, "The Steel Industry of the Prairie Provinces", Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1963, p. 13, (Mimeographed.)

TABLE 8

APPROXIMATE WEIGHT PER MILE OF PIPE AND WIDTH OF SKELP REQUIRED FOR SELECTED PIPE SIZES

Size Nominal (inches)	Outside Diameter (inches)	Usual Wall Thickness (inches)	Approximate Weight per Mile[a] (net tons)	Width of Skelp of Plate (inches)
6	6.625	.188	34.12	19.6
8	8.625	.188	44.72	26.0
10	10.750	.219	65.03	32.5
12	12.750	.250	88.11	38.5
16	16.00	.250	111.02	48.6
24	24.00	.375	249.79	73.2
36	36.00	.375	376.67	114.0

[a] $W = 10.68\,(D-t)t$ for average wall pipe

where
W = weight in pounds per foot (carried to four digits)
D = outside diameter in inches (to three decimals)
t = specified wall thickness (to three decimals)

SOURCE: Taken from, T. H. Janes and R. B. Elver, "The Steel Industry of the Prairie Provinces", Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1963, p. 20. (Mimeographed.)

TABLE 9

PIPELINE MILEAGE IN THE FOUR WESTERN PROVINCES, 1959 AND 1960, ESTIMATED TONS INSTALLED, BY SYSTEM, IN 1960

System[a]	Weighted Average Diameter (inches)	Approximate Weight per Mile (net tons)	Installed Pipeline Mileage (cumulative) in the four Western Provinces		Estimated Tons Installed in 1960
			1959	1960	
Gathering	7	36	4,729	5,572	30,349
Transmission	22	229	10,523	11,409	202,894
Distribution	6	34	6,925	7,594	22,746
Total	-	-	22,177	24,575	255,999

[a]Gathering and transmission includes oil and gas pipelines; distribution is concerned only with gas pipelines.

SOURCE: Taken from, T. H. Janes and R. B. Elver, "The Steel Industry of the Prairie Provinces", Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1963, p. 22. (Mimeographed.)

Western Canada, a plant would have to have facilities for rolling skelp over forty-two inches for a pipe diameter of fifteen inches in width. In order to supply pipe for the long distance natural gas transmission lines, which use pipe having a diameter in the neighbourhood of thirty-six inches, the mill would have to produce skelp in widths up to 114 inches.

Janes and Elver estimate that pipe consumption in Western Canada will vary between 350,000 to 400,000 tons per year for many years to come. They further estimate that the Prairies could expect to supply approximately 300,000 tons of skelp annually if an integrated steel operation was set up.

T. H. Janes, in the following quotation, explains how they arrived at such a conclusion:

> From the history of building oil and gas pipelines in the four western provinces coupled with other steel pipe and tube consumption and discussing with oil and gas authorities the future of large pipeline projects, it was estimated that total pipe consumption would probably range from 350,000 to perhaps as much as 450,000 tons a year to 1975. An average annual consumption to 1970 of about 350,000 tons a year, from information at hand, appears reasonable although some authorities might consider it on the low side. A certain amount of pipe will continue to be imported or come from Ontario plants. Thus it was assumed that the maximum in steel rolling facilities that might be established on the Prairies to roll skelp, even if such facilities could supply the whole range of widths, and acquire nearly all of the markets, would be 300,000 tons a year.[9]

If the same procedure is followed as was used by

[9]Letter from T. H. Janes, Senior Scientific Officer Department of Mines and Technical Surveys, Mineral Resources Division, Ottawa, June 19, 1963.

Janes and Elver in Table 9, it is possible to estimate the tonnages of steel pipe which have been installed in the Prairies from 1956 to 1961 as is set out in Table 10.

TABLE 10

ESTIMATED TONNAGES OF STEEL PIPE INSTALLED IN THE PRAIRIES, 1956 TO 1961

Year	Tonnage
1956	413,711
1957	655,080
1958	259,506
1959	310,273
1960	255,999
1961	439,986

SOURCE: This information was compiled from Janes and Elver, "The Steel Industry of the Prairie Provinces", Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1963, p. 22. (Mimeographed.)

To conculde this section, it would be useful to review a study compiled by Hu Harries and Associates, Ltd. concerning the potential demand for steel by the petroleum and natural gas industries.[10] The study projected the

[10]Hu Harries and Associates, Ltd., "The Probable Future Market for Western Canadian Iron Ore," A study prepared for Premier Steel Ltd., Edmonton, Alberta, June 23, 1961. (Mimeographed.)

demand for steel by the oil and gas industries for a twenty-year period. In addition to the demand for pipe, which was considered above, the study cited also considers the demand for casing, tubing, drill pipe, and sucker rods; all of which are directly concerned with oil well production. These items could bear serious consideration as prospective products to be manufactured in Western Canada as they are of a relatively small diameter and could be produced in a smaller installation than that which would be necessary to produce large diameter transmission pipe. The inherent weakness in projections of items such as these is that their consumption is directly dependent upon drilling activity, which is subject to wide fluctuations.

Before looking at the actual projections which Harries has made, an important point should be mentioned in connection with oil well casing. At present, the greater portion of the casing presently being used in Canada is of seamless quality.[11] The type of casing which would be produced in Western Canada would not be of this type but rather would be electric resistance weld casing as there is no facility capable of producing seamless pipe located in the Prairies. There has been considerable controversy over the acceptability of electric resistance weld casing as a substitute for the critical specifications required

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[11]The lack of a seam in the pipe, as the term implies, is preferred by the oil industry as the probability of a leak occurring is greatly reduced. This is a particularly important consideration because the pipe is placed in the oil well itself - therefore, a leak would necessitate a great deal of expense to repair.

by the oil companies. There is a possibility that surface casing, which is considered to be less critical by the oil companies, could be produced by the electric resistance weld method.

The consumption of casing and tubing in the past will serve as a useful guide in viewing the projected figure. From 1953 to 1958, consumption ranged from 102,400 tons to 115,500 tons with a low of 88,300 tons in 1954 and a high of 174,900 tons in 1956.[12]

Table 11 gives Hu Harries and Associates' projections concerning casing, tubing, drill pipe, and sucker rods for the years 1965 to 1980. In addition to the forecasts set out in this table, Harries also predicts that the yearly requirements for flowline pipe will range from 21.5 thousand tons in 1965 to 55.9 thousand tons in 1980, based upon a figure of 2,000 feet per well.[13]

The remainder of Hu Harries and Associates' projections consist of estimates of the future demand in Western Canada for pipe by the oil industry and by the natural gas industry broken down into distribution, gathering, and transmission lines. As the main concern is with a total tonnage requirement, all of these projections have

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[12] "A Report of the Market and Prices for Steel Products in Western Canada," A report produced by a panel composed of one member from each of the following companies: Stewarts and Lloyds of Canada, Ltd., Alberta Phoenix Tube and Pipe Co., Schneider et Cie., Premier Steel Mills, Limited, September 28, 1959, p. 3. (Mimeographed.)

[13] Hu Harries and Associates, Ltd., op. cit., p. 5.

TABLE II

PROBABLE DEMAND FOR CASING, TUBING, DRILL PIPE
AND SUCKER RODS, 1965 - 1980
(THOUSANDS OF TONS PER YEAR)

	1965	1970	1975	1980
Surface Casing	34.3	54.3	76.3	94.2
Sucker Rods[a]	3.2	11.0	12.0	13.2
Production Casing	131.8	203.0	311.7	377.3
Drill Pipe[b]	5.3	8.5	11.9	14.7
Tubing	49.0	76.8	118.0	142.8
Total	233.6	353.6	529.9	642.2

[a]Premier Steel Mills, Ltd., is currently producing sucker rods at their fabricating plant in Edmonton.

[b]Drill pipe is a very specialized product and it is unlikely that any Canadian manufacturer would undertake production of it.

SOURCE: Hu Harries and Associates, Ltd., "The Probable Future Market for Western Canadian Iron Ore," A study prepared for Premier Steel Ltd., Edmonton, Alberta, June 23, 1961. (Mimeographed.)

been combined into Table 12 which follows. The figures in Table 12 would seem to be conservative in view of the fact that the estimated tonnage installed in 1960 was 255,999 tons.[14]

TABLE 12

STEEL PIPE REQUIREMENTS FOR THE OIL AND GAS INDUSTRIES IN WESTERN CANADA, 1965 - 1980

Period	Thousands of Tons per year
1965	113,750
1970	141,360
1975	235,860
1980	247,400

SOURCE: Hu Harries and Associates, Ltd., "The Probable Future Market for Western Canadian Iron Ore," A study prepared for Premier Steel Ltd., Edmonton, Alberta, June 23, 1961. (Mimeographed.)

This chapter, thus far, has examined the consumption patterns for steel rolling mill products in the Prairies and has shown what portion of the consumption is produced within the region and what portion is imported. In addition to this, the consumption patterns for steel products in the oil and gas industry has been examined; particularly the use of steel pipe for pipeline construction. The concluding portion of this chapter is concerned with a series of pro-

[14]See Table 10

jections of the consumption of steel products in western Canada.

D. Projected Demand for Steel Products in Western Canada.

The most reliable method of estimating the quantity of steel which will be demanded at some future date would be to use per capita consumption figures and project the quantity on the basis of the expected population.

A report prepared for the Royal Commission on Canada's Economic Prospects states:

> Canadian steel consumption twenty-five years from now cannot be measured precisely, though obviously a very substantial increase can be expected, assuming that economic activity remains at a fairly high level over the period. It has already been stated that, even if the Canadian economy achieves an over-all per capita production as high as that now obtained in the United States, steel consumption can scarcely be expected to reach the present U. S. per capita level, which would mean a total consumption of between 17½ and 18 million ingot tons a year.
>
> If three-quarters of the gap between the Canadian rate of steel consumption and the present U. S. rate were closed by 1980, Canadian per capita consumption would be around 1,225 lbs. annually, a rate, it should be noted, that has been exceeded in the United States only in the four most active post-war years, 1950, 1951, 1953, and 1955. At this rate, total Canadian consumption of primary steel in 1980 would approach 16 million tons. If only half the gap between the Canadian rate of consumption and the present U. S. rate were closed, the former would be about 1,075 pounds, and total annual consumption would be around 14 million tons.[15]

The per capita consumption of steel in Canada in 1963 is approximately 800-825 pounds per person.[16] The

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[15]Lucy Morgan, <u>The Canadian Primary Iron and Steel Industry</u> (Ottawa: Royal Commission on Canada's Economic Prospects, October 1956) pp. 46-7.

[16]Ibid., p. 68.

problem concerning Western Canada is that although the Prairies may consume at the same rate as the Canadian average, they could not hope to supply all of their consumption locally due to the diversity of the items consumed. To illustrate this last point further, Table 13 forecasts the population of the Prairie Provinces, and shows the results of using per capita consumption figures.

TABLE 13

POPULATION FORECAST PRAIRIE REGION,
1960 - 1975
(THOUSANDS)

Year	Prairie Region
1960	3,306
1965	3,676
1970	4,073
1975	4,524

SOURCE: Committee on Manitoba's Economic Future, "Manitoba 1962 - 1975," A report to the Government of Manitoba, Winnipeg, 1963, p. IV-1-8. (Mimeographed.)

Using the 1960 population figure of three million people and applying a per capita consumption figure of 800 pounds, a total consumption of 1,200,000 tons per year is arrived at. Referring to Table 1, it is found that our total consumption of steel rolling mill products was only 467,199 tons. The large remainder of the consumption

obviously was made up in the form of various manufactured items such as cars and refrigerators. Therefore, it would be erroneous to assume that the total consumption of steel in its various forms represents a potential market for an integrated facility in Western Canada.

Tables 14 and 15 have taken these factors into account in that they have projected the consumption of steel rolling mill products only; consequently, they represent a reasonable estimate of the potential demand which an integrated steel industry can expect to find in the future.

E. Summary

The consumption of steel rolling mill products in the Prairie Provinces has ranged from 390,961 tons to 501,967 tons for the years 1956 to 1961 inclusive. The production of steel within the Prairie Provinces has ranged from 89,967 to 196,138 tons during the same period. These figures in themselves indicate a relatively large market which the Prairie producers could hope to supply. In fact, however, much of this consumption is in the form of products which could not be produced economically due to the capital cost of the equipment required for production. The is particularly true in the case of large structurals, sheet, and strip. There is a sizeable potential however, in the case of skelp which is used in the oil and gas industry. It has been indicated previously that the potential

TABLE 14

CONSUMPTION OF STEEL ROLLING MILL PRODUCTS BY SECONDARY INDUSTRIES IN THE PRAIRIE PROVINCES OF CANADA
(TONS - 2,000 LBS.)

	Actual			Estimated			
	1958	1959	1960	1961	1965	1970	1975
Structurals	65,663	71,601	58,687	53,629	67,395	78,986	95,096
Bars	91,163	106,083	95,290	102,633	117,022	136,136	165,761
Strip	1,426	1,850	1,830	1,900	2,600	3,200	3,720
Sheet	47,793	61,071	55,230	54,975	64,275	74,601	86,240
Skelp	77,549	62,300	95,550	135,050	184,600	224,450	232,200
Plate	33,334	39,165	46,815	160,487	270,498	340,143	368,947
Cold Formed Shapes	286	312	418	397	547	1,031	1,638
Total	317,214	342,382	353,790	509,071	706,937	858,547	953,602

SOURCE: Committee on Manitoba's Economic Future, "Manitoba 1962-1975," A report to the Government of Manitoba, Winnipeg, 1963, p. IV-1-8. (Mimeographed.)

TABLE 15

ESTIMATED STEEL CONSUMPTION,[a] BY PROVINCE, PRAIRIE PROVINCES, 1958 TO 1961, FORECAST TO 1970
(NET TONS)

	1958	1959	1960	1961	1965	1970
Alberta	177,433	210,993	178,276	351,377	450,000	571,429
Saskatchewan	76,043	90,426	76,404	50,197	50,000	57,143
Manitoba	139,411	165,780	140,074	100,393	150,000	171,428
Total	392,887	467,199	394,754	501,967	650,000	800,000

[a]Total consumption is domestic and foreign shipments. Provincial consumption is estimated by proportioning for Alberta, Saskatchewan and Manitoba as follows: 1.4/0.6/1.1 in 1958 to 3.5/0.5/1.0 in 1961, both actual, rising to 4.5/0.5/1.5 in 1965 and to 5.0/0.5/1.5 in 1970, both forecast.

SOURCE: Taken from, T. H. Janes and R. B. Elver, "The Steel Industry of the Prairie Provinces", Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1963, p.14. (Mimeographed.)

consumption in this area is larger than the consumption of skelp would seem to indicate as a sizeable quantity of finished pipe is imported. This type of consumption would be particularly suited to a producing unit situated in Edmonton because the majority of the pipe mills in Western Canada are located in Alberta, close to Edmonton.

The projections of future consumption in the Prairie Provinces indicate that a fully integrated facility could expect to find the size of the market about double its present size by 1975 to 1980.

In conclusion, it is estimated that the tonnage which an integrated iron and steel industry, located in Alberta, could hope to supply to the market at present would approximate 300,000 tons per year, made up of 200,000 tons of skelp and 100,000 tons of merchant bar products. This estimate is based on the assumption that the integrated industry will be created through an expansion of the existing facilities of Premier Steel Mills, Ltd. The reason for this assumption is the connection between Premier Steel Mills, Ltd. and Camrose Tubes, Limited which would provide a captive market for any skelp which Premier could produce.

The output of the integrated industry would be composed of 200,000 tons of skelp under seventy-two inches wide, and 100,000 tons of merchant bar products. Premier's present production facilities are capable of producing the merchant bar output. Therefore, the expansion would mean adding facilities capable of producing 200,000 tons of

skelp per year. The feasibility of installing these facilities will be dealt with in Chapter VII.

The 300,000 ton estimate would appear to be realistic in view of the reply received from Mr. T. H. Janes concerning the tonnage which an integrated industry could hope to produce when he says:

> I agree, in general, with your estimate that the maximum tonnage to be supplied by an integrated facility in any year would be between 300,000 and 350,000 tons. This, I believe would be a maximum so far as skelp is concerned, bearing in mind complete integration of steelmaking and pipemaking facilities (Premier and Camrose Tubes Limited); to this should be added present output of merchant mill products. . . . If the integrated facility was able to supply all pipemaking plants in the four western provinces with their skelp requirements, your tonnage estimate is reasonable, but if "non-captive" pipemaking facilities continue to use skelp from Regina or other sources, your market outlook for an integrated facility would be high.[17]

The 300,000 ton estimate, as was stated above, is composed of only 200,000 tons of skelp and 100,000 tons of merchant bar products, therefore the skelp estimate is 100,000 to 150,000 tons below the maximum which Janes states. In view of this substantial margin, it is reasonable to assume that the estimated tonnage is realistic and, therefore, can serve as the minimum tonnage which an integrated iron and steel industry could hope to supply to the local market.

Now that the minimum tonnage has been established, the remaining chapters will be concerned with the feasibility of establishing the necessary facilities to produce this tonnage.

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[17]Letter from T. H. Janes, op. cit.

CHAPTER V

THE EFFECT OF THE CANADIAN FREIGHT RATE STRUCTURE ON THE WESTERN CANADIAN MARKET FOR STEEL

This chapter will examine the freight rate structure that governs the movement of steel rolling mill products into the Western Canadian market and ascertain what role this rate structure plays in the pricing policies for these products. To set the stage for the discussion of this structure, the pricing policies of the major steel producers in Canada, all of whom are located east of the Great Lakes, will be outlined.

A. General Pricing Policies

Two factors are used to determine the mill purchase price (equivalent to f.o.b. price) of steel rolling mill products. The first of these factors is the base price which applies to the standard items of steel products, such as bars, sheet and strip, plates, and structurals. The second factor is the extras which are additional charges for size, quality, and other specifications which differ from those established for the standard items. The system of extras is very complex for it covers a wide range of items. However, the extras tend to be relatively uniform

throughout North America as they are based on the charges set by the major United States steel companies. The degree of uniformity is such that a comparison of base prices between companies would be a valid one.[1]

Base prices in North America are, in fact, administered prices because they do not fluctuate with the demand for steel-mill products. The only deviations from these prices are freight allowances made by the shipping mill. The stability of these prices is assured through the price leadership action of one of the major producers and through the wide publicity given these prices in the trade journals. This practice eliminates any doubt of what the current price situation is because the information is readily available to anyone. The Canadian prices do not necessarily follow exactly the leadership pattern established by the major American companies because the Canadian tariff provides a buffer between the two industries. There can be no doubt, however, that the steel prices within Canada must be competitive[2] with the cost of steel from the United States landed in Canada to ensure the retention of the Canadian market. In recent years, the spread between the United States and Canadian prices has been narrowing; the

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[1]For a discussion of the pricing policy followed by the steel industry, see: Walter Adams, The Structure of American Industry (Third Edition; New York; Macmillan, 1961) pp. 160-2.

[2]Competitive is taken to mean that the Canadian price would not exceed the United States price plus duty and transportation costs. See Tables 16 and 17.

quoted price on some items is lower in Canada than in the United States.[3] The primary reason for the narrowing of the gap between the Canadian and United States steel prices is the improved technology that has been adopted by the Canadian industry. These advances have meant that the Canadian producer is, in some cases, more efficient than his American counterpart in spite of the difference in size. The reason why the Americans have not incorporated such technological advances into their mills is that the American industry has been operating at a level which is far below the potential capacity, therefore, the installation of new facilities has been kept at a minimum. If the discount on the Canadian dollar, in terms of the United States dollar, is considered, then it becomes evident why some steel items that are produced in Canada can compete in the export market. Therefore there is no reason to assume that the price of some steel products in Canada will follow the price leadership of the large American firms.

The pricing policies that are currently being followed in Western Canada are straightforward. The western producers set their price slightly below the landed price of the eastern mill purchase price plus the freight[4] costs

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[3]Steel, January 21, 1963, pp.55-70

[4]It is not necessary to consider the handling charges incurred in the shipment of the goods because they are relatively small. The shipping and receiving companies do most of the handling, therefore the costs are included in the production costs, and the handling costs necessary to ship a short distance are approximately the same as necessary to ship across the country.

incurred in the shipment of the product to the western market.[5] The same procedure would be followed in the case of a competitive American producer except that the American producer's landed cost would include duty.

Table 16 shows selected items from the Canadian Primary Iron and Steel Tariff so as to give some indication of the amount of duty which a foreign producer has to overcome. A portion of the decline in imports of steel products, as illustrated by Table 1 of the preceeding chapter, can be attributed to the tariff structure in that it has allowed the Canadian industry to develop and mature to its present state. It can be assumed, however, that the tariff is becoming less important in that Canadian industry seems able to compete on an equal basis with the larger, but less efficient, United States industry. This self-sufficiency is evidenced by the increasing quantities of steel which Canada is exporting.

Table 17 indicates the differences between the laid-down prices of the American and Eastern Canadian producers in Western Canada.

Given the above, it is now possible to examine the freight rate structure as the actual mechanics of price setting in Western Canada are of little consequence under the present scheme. This is evidenced by the fact that Western prices differ from Eastern prices only by the

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[5]Premier Steel quotes prices on their products by using the western price book prepared by the Steel Company of Canada, Limited.

TABLE 16

SELECTED ITEMS FROM THE CANADIAN PRIMARY IRON AND STEEL TARIFF

Tariff Item	Description	British Preferential Tariff	Most Favoured Nation Tariff	General Tariff
378	Bars and Rods - per ton	$4.25	$7.00	$7.00
380	Plates - hot or cold rolled - per ton	$4.25	$8.00	$8.00
384	Skelp - hot rolled - for pipe production	Free	5 p.c.	5 p.c.
388	Iron or steel angles, beams, etc. - per ton	Free	$3.00	$3.00

SOURCE: Dr. Lucy Morgan, The Canadian Primary Iron and Steel Industry (Ottawa, Royal Commission on Canada's Economic Prospects, October 1956) pp. 83-4.

TABLE 17

COMPARISON OF THEORETICAL LAID-DOWN PRICES IN WESTERN CANADA OF SELECTED STEEL PRODUCTS FROM U. S. AND CANADIAN MILLS AS OF JANUARY, 1956 (CALCULATED ON BASE PRICES ONLY, $ PER 100 LBS. CARLOAD LOTS)

Commodity	Destination	Point of Origin	Base Price	Freight	Duty	Landed Price
Bars	Calgary	Chicago	4.65	2.12	.58	7.35
Bars	Calgary	Hamilton	4.80	2.35	-	7.15
Structurals	Calgary	Geneva	4.60	1.63	.30	6.53
Structurals	Calgary	Sault Ste. Marie	4.80	2.01	-	6.81
Plates	Edmonton	Geneva	4.50	1.92	.56	6.98
Plates	Edmonton	Hamilton	4.85	2.23	-	7.08
Hot Rolled Sheets	Calgary	Chicago	4.325	2.12	.54	6.985
Hot Rolled Sheets	Calgary	Hamilton	4.50	2.23	-	6.73

SOURCE: Dr. Lucy Morgan, The Canadian Primary Iron and Steel Industry (Ottawa, Royal Commission on Canada's Economic Prospects, October, 1956) pp. 83-4.

amount of freight differential that exists between the two regions. The primary concern is with the size of the differential, often referred to as a natural tariff, for it is the size of this differential that determines the boundary lines of the market in which the Western producers are able to sell their goods. This factor also decides whether or not the Western producers are able to produce certain commodities with production facilities which cannot, because of their smaller size, take advantage of the economics of scale open to the larger producers in Eastern Canada or the United States.

B. Freight Rates

There are three basic types of freight rates that apply to the movement of iron and steel products:[6]

(1) Class rates, normally the highest rate of the three, are applied on a mileage scale for a given class of goods between any two points.

(2) Commodity rates are lower than the class rates and are set for specific products which are being shipped between designated points, with minimum quantities specified. The minimum quantities for iron and steel products on commodity rates generally range between 40,000 and 80,000 pounds.

(3) Agreed charges, the lowest rates of all, are contracts between the railway and the shipper under which the shipper agrees to ship a specified portion of his production over the railway's lines to the designated destination. The agreed charges involve minimum quantities which are substantially higher than those called for under the commodity rates. These agreed charges are negotiated between

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[6]The descriptions of the basic types or rates were obtained from various reports prepared by Premier Steel for use within the company.

> specific companies and the railways. However, once established, other shippers may enter the agreement within twenty-four hours of giving notice of their intent to do so.

The last two rates, commodity rates and agreed charges, are considered to be competitive rates. These rates are set up by the railway to obtain additional traffic or to retain traffic which may be lost to other forms of transportation. A number of competitive rates, for relatively short distances, have been negotiated as a result of the low rates charged by trucking firms on a back-haul basis. These low back-haul rates result from a predominance of traffic moving in one direction. Consequently, when the trucks return to their home base, they are often willing to carry cargo at a price that will cover only their out-of-pocket expenses.

The most important competitive rates that have been established for the Canadian steel industry are the agreed charges covering the movement of steel from the Eastern Canadian mills to the west coast market. The establishment of these rates is the direct result of the low water rates that are available via the Panama Canal. The existence of these agreed charges has been the only factor that has kept the eastern mills competitive in the west coast market.

It is worth noting that the agreed charges to the west coast are extremely low, $1.20 per 100 pounds for most products, amounting to less than sixty per cent of the existing commodity rates from the same shipping points to Calgary and Edmonton. Some of the agreed charges allow a

participating producer within the triangle extending from Sault Ste. Marie to Hamilton to Montreal to ship to the west coast at an identical rate, regardless of the actual mileage.[7]

These low rates do not extend to the Alberta market because there are no rates in existence comparable to the water rates through the Panama to form the basis for negotiations with the railways. On some products, the best rate to the Prairie points may be the agreed charge to Vancouver plus the commodity rate back to the Prairies. An example of this would be the shipment of bars from Hamilton to Edmonton which, on a minimum of 100,000 pounds would involve an agreed charge of $1.10 per 100 pounds from Hamilton to Vancouver, plus a commodity rate of $1.35 per 100 pounds back to Edmonton; thus yielding an overall rate of $2.45 per 100 pounds, as opposed to the regular rate of $2.80.[8] This example illustrates the unusual conditions that exist in the Canadian freight rate structure, for the Hamilton based plant is more competitive in the Vancouver market than is the Edmonton based plant.

In recent years, there has been a considerable upsurge in the use of trucks to move industrial products in Canada. This has meant that the railroads have had to negotiate a large number of agreed charges to attempt to retain their share of the market. They are quite willing

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[7]Much of the information included in this section was gained from personal experience at Premier Steel Mills, Ltd.

[8]Lucy Morgan, op. cit., p. 29.

to negotiate such an agreement because one of the provisions is that the shipper will move eighty per cent of the product covered by the agreement via the railways.

In view of the above trend, the situation in the Prairies is such that approximately ninety-five per cent of the steel moving by rail is covered under an agreed charge.[9] This percentage includes the movement of steel within the Prairies as well as shipments from Eastern Canada. Therefore, when considering the impact of the freight rate structure on the movement of steel products in the Prairies, it is only necessary to look at the agreed charges.

The agreed charges vary according to the state of manufacture; the closer the product is to the raw state, the lower the rate. Consequently, it is often cheaper to fabricate or finish the product in the market in which it will be consumed, thereby minimizing the freight costs.[10]

To assess the competitive position of the Prairie manufacturer, it will be assumed that the average cost of transporting steel rolling mill products to the Alberta region from Eastern Canada is two dollars per 100 pounds, or forty dollars per ton. This estimate is not an average of all rates covering steel movements into the Prairies

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[9]Personal interview with Mr. W. Peterson, Assistant Treasurer, Premier Steel Mills, Ltd., Edmonton, Alberta, October 18, 1963.

[10]Dosco follows this practice by shipping billets from their Nova Scotia plant to their rolling mill facilities in Montreal, thereby decreasing their total freight costs.

but rather is concerned with large quantities of steel moving under agreed charges. The range covered by this estimate is quite narrow, that is, within three dollars either way. The one major exception is skelp, the significance of which will be discussed later in this chapter.

The rates from Manitoba and British Columbia to the Edmonton area are between twenty-two and twenty-five dollars per ton. Therefore, the Alberta producer would enjoy a natural tariff of twenty-two to forty dollars per ton at his plant depending on where competitive products are produced.[11]

It should be pointed out that information regarding agreed charges is open only to the parties to the agreement. The averages that have been assumed are based upon discussions with representatives of the industry who are familiar with the structure of the agreed charges.

A note of caution should be added in that it is not unusual for the major steel producers to absorb a portion of the freight cost to become more competitive with the local producers.[12] This practice is particularly prevalent when there is a surplus of steel available. The procedure is to grant the purchaser a freight allowance equal to a portion or all of the freight cost incurred in shipping the

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[11]Based on an average selling price of $150.00 per ton, the margin provided by the freight structure would range between fifteen and twenty-seven per cent.

[12]Personal interview with Mr. G. R. Heffernan, President, Peace River Mining and Smelting, Ltd., March 5, 1963.

goods from the plant to the consumer. Therefore, the mill purchase price or f.o.b. price is left unaltered.

The following description illustrates what is involved in an agreed charge. This particular agreed charge, which was obtained from Premier Steel's traffic consultant, was negotiated between the Steel Company of Canada, Ltd., and the Canadian National Railway.

Structural Steel - Carload rates to Edmonton, Alberta.

From Hamilton, Ontario.

Agreed charge No. 428 from Steel Co. of Canada, Ltd. Hamilton, Ontario, minimum 100,000 lbs.

Rates: \$2.40 per 100 lbs. - via all rail

\$2.35 per 100 lbs. - via rail-lake-rail) during lake

\$2.32 per 100 lbs. - via water - rail) season

Applicable on:

Steel - Angles, not punched, drilled or further manufactured than hot rolled and cut to length.

Bars, not bent, drilled or fabricated; square, round or otherwise shaped in the drawing or rolling process. Will not apply on cold rolled, drawn, or machine steel or shafting.

Plate, 3/16 of an inch or over in thickness, plain, not corrugated, bent, drilled or fabricated.

Sheet, less than 3/16 of an inch in thickness, galvanized or plain, corrugated or not corrugated, not bent, drilled or fabricated.

In the above description, a rail-lake-rail rate was quoted from Hamilton to Edmonton. The reason for this particular structure is that the lake portion of the route is

handled by a shipping company that is a subsidiary of the Canadian Pacific Railways and whose originating point is on the east side of Lake Huron. Consequently, the steel is shipped from Hamilton to the Lake Huron port and is then shipped by water to the Lakehead where it is again transferred to rail.

Thus far it has been shown that the freight rate structure provides the Alberta producer with a twenty-two dollar margin over steel coming in from British Columbia and a forty dollar margin over steel coming in from Eastern Canada. Based on an average selling price of $150.00 per ton, these margins represent fifteen to twenty-seven per cent of the selling price.

In Chapter IV, it was stated that one of the most important markets available to an integrated steel facility in the Prairies is the skelp consumed by the oil and gas industry. To conclude this chapter, it would be useful to examine the freight rates that govern the shipment of skelp from Eastern Canada. In addition, as the primary concern is with Alberta, the rates covering skelp coming into Alberta from Regina, where Interprovincial Steel and Pipe Corporation Ltd.'s plant is located, will be examined.

Skelp moving to Edmonton from Hamilton and Sault Ste. Marie does not move under an agreed charge similar to those covering shipments to Vancouver because there are different rates for the two locations. The minimum weight requirement is 115,000 pounds. The rates are $1.71 per

100 pounds from Hamilton and $1.47 per 100 pounds from Sault Ste. Marie. This gives the Alberta producer a differential of $34.20 per ton, and $29.40 per ton respectively. Based upon a selling price of $150.00 per ton for skelp, these margins provide substantial protection for the local producers. If skelp is shipped to Edmonton for fabrication into pipe and then is shipped to Vancouver, the rate for both Hamilton and Sault Ste. Marie is ninety cents per 100 pounds which is equal to the rate from Hamilton or Saulte Ste. Marie direct to Vancouver. In this case, the margin is lowered to $18.00 per ton.[13]

Where skelp is shipped from Regina to Edmonton, the rate is fifty-five cents per 100 pounds with a 60,000 pound minimum and fifty cents per 100 pounds with an 80,000 pound minimum. Therefore, the Alberta-based producer has a $10.00 per ton margin over the Saskatchewan producer. Based on a selling price of $150.00 per ton, the ten dollar freight costs amounts to a margin of seven and one-half per cent. Therefore the advantage that an Alberta based producer would have is substantial.

This chapter has illustrated the cost advantage that a local producer would enjoy over the larger industries located in Eastern Canada. The question which must be answered is whether this margin or natural tariff is of sufficient size to warrant establishing fully integrated facilities. The next chapter is devoted to one

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[13] Mr. W. Peterson, op. cit., June 3, 1963.

side of the question; that is, the raw materials necessary for an integrated iron and steel industry.

CHAPTER VI

RAW MATERIAL INPUTS FOR THE INDUSTRY

At present, the steel industry in the Prairies is wholly dependent on scrap steel as the basic raw material for steel production. The purpose of this chapter is to examine the volume and quality of scrap that is being generated and to make some observations concerning the availability of scrap in the future. In addition, the possibility of using iron ore as an alternate source of raw material will be examined. The latter discussion will involve not only the ore deposits which could be used but also a description of the various beneficiation processes that serve to increase the iron content of the ore.

Before discussing these raw materials, it should be pointed out that only scrap steel and iron ore will be examined. The reason for this narrow approach is that the other inputs, that is, fuel, labour and miscellaneous inputs, are readily available. The fact that a conventional blast furnace type of operation is not feasible for a small scale operation eliminates the need for large quantities of coking coal and limestone. The critical factor therefore, is the availability of sufficient quantities of scrap steel and iron ore.

A. Scrap Steel

Up to just recently, the scrap steel market in the Prairies has been predominantly an export market in that Prairie scrap consumption was only a nominal portion of the total amount of scrap generated. The excess supply was generally shipped to Eastern Canada. Until 1954, the only consumer in the Prairies was Manitoba Rolling Mills Company which had an annual furnace melting capacity of 108,000 tons. In the following year, Premier Steel Mills Limited came into being, thereby doubling the total melting capacity of the Prairies. Since then, two other plants have been established; Interprovincial Steel and Pipe Corporation, Ltd. in Regina, and Griffin Steel Foundries Ltd. in Winnipeg, and both are relatively large consumers of scrap steel. These developments have altered the situation in that the Prairies are no longer a major exporter of scrap steel but now occasionally import scrap.[1]

> While there can be considerable variation in the position in any one year, there is little doubt that during the past five years, the Prairies have moved from that of a scrap surplus region to one in which over time will become a permanent net scrap importer.[2]

The above statement summarizes the changes that have occurred in the Prairies - a change which is the result of

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[1]In 1959, due to the establishment of Interprovincial Steel Ltd. and Griffin Steel Foundries Ltd., which necessitated the building up of large inventories, some scrap was imported from the United States.

[2]Canada, Department of Trade and Commerce, "Steel Scrap Generation in Western Canada," Ottawa, April, 1960, p. 12. (Mimeographed.)

the development of the steel industry within the region.

At present, the rate of scrap generation in the Prairies is in the order of 215,000 tons[3] annually. For any particular year, the average tonnage can be expected to vary substantially as the supply is relatively price elastic. When the amount of scrap demanded drops, thereby causing the price to fall slightly, the flow tends to dry up and inventories build up at the source. One of the main reasons for this sensitivity to price is the fixed nature of the shipping costs required to move the scrap to the eastern markets.

Tables 18 and 19 illustrate the pattern of scrap generation that existed in the Prairies from 1954 to 1961. Table 18 illustrates the wide fluctuations in shipments to points outside the Prairies which are the result of a fluctuating demand. The transition from Table 18 to Table 19 further illustrates the impact of the establishment of new productive facilities.

It should be pointed out that the study conducted by the Department of Trade and Commerce, from which Tables 18 and 19 were drawn, provide the only data available concerning scrap steel in the Prairies.

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[3]The provincial distribution of the 215,000 tons is approximately; Manitoba, 115,000 tons; Saskatchewan, 30,000 tons; Alberta, 70,000 tons. Hu Harries and Associates Ltd., "The Probable Future Market for Western Canadian Iron Ore," A study prepared for Premier Steel Mills, Limited, Edmonton, Alberta, June 23, 1961. (Mimeographed.)

TABLE 18

ESTIMATED STEEL SCRAP DEMAND AND SUPPLY FOR THE PRAIRIE PROVINCES
1954 - 1958
(IN SHORT TONS)

Province	Year	Steel Furnace Melting Capacity	Scrap Consumed by Provinces	Exports from the Given Province	Net Shipments to/from Canadian Points Outside the Given Province	Estimated Total Scrap Generation in the Given Province
Manitoba	1954	111,000	70,817	709	+ 7,470	78,996
	1955	115,000	92,520	436	+ 39,745	132,701
	1956	117,000	128,128	246	- 46,185	82,189
	1957	117,000	86,068	1,505	+ 871	88,444
	1958	117,000	74,800	193	+ 76,035	151,028
Saskatchewan	1954	-	-	10	+ 11,172	11,182
	1955	-	-	68	+ 15,779	15,847
	1956	-	-	452	+ 53,286	53,738
	1957	-	-	167	+ 35,800	35,967
	1958	-	-	138	+ 16,683	16,821
Alberta	1954	2,000	1,109	50	+ 28,833	29,992
	1955	37,000	5,941	73	+ 48,433	54,447
	1956	50,000	38,654	183	+ 57,106	95,943
	1957	50,000	45,999	33	+ 30,836	76,868
	1958	103,000	42,232	45	+ 16,827	59,104
Total Prairies	1954	113,000	71,926	769	+ 47,475	120,170
	1955	152,000	98,461	577	+ 103,957	202,995
	1956	167,000	166,782	881	+ 64,207	231,870
	1957	167,000	132,067	1,705	+ 67,507	201,279
	1958	220,000	117,032	376	+ 109,545	226,953

SOURCE: Canada, Department of Trade and Commerce, "Steel Scrap Generation in Western Canada," Ottawa, April, 1960, p. 7. (Mimeographed.)

TABLE 19

ESTIMATED FUTURE DEMAND AND SUPPLY OF STEEL SCRAP FOR THE PRAIRIE PROVINCES, 1959 - 1961 (IN SHORT TONS)

	Province	Steel Furnace Melting Capacity	Estimated Scrap Consumption by Provinces	Estimated Steel Scrap Supply by Prov.	Surplus of Shortfall
1959	Based on steel scrap requirements at seventy per cent of steel furnace melting capacity for Manitoba, and sixty-five per cent for Alberta.				
	Manitoba	172,000	120,000	205,000	+ 95,000
	Saskatchewan	-	125,000[a]	60,000	- 65,000
	Alberta	103,000	66,000	72,000	+ 6,000
	Total Prairie	172,000	120,000	215,000	+ 95,000
1960	Based on steel scrap requirements at sixty-five per cent of steel furnace melting capacity for Manitoba, thirty per cent for Saskatchewan and sixty per cent for Alberta.				
	Manitoba	191,000	124,000	230,000	+106,000
	Saskatchewan	150,000	45,000	45,000	--
	Alberta	104,000	62,000	75,000	+ 13,000
	Total Prairie	445,000	231,000	350,000	+119,000
1961	Based on steel scrap requirements at seventy per cent of steel furnace melting capacity for Manitoba, sixty per cent for Saskatchewan and sixty-five per cent for Alberta.				
	Manitoba	191,000	134,000	185,000	+ 51,000
	Saskatchewan	150,000	90,000	45,000	- 45,000
	Alberta	104,000	68,000	78,000	+ 10,000
	Total Prairie	445,000	292,000	308,000[b]	+ 16,000

[a]Inventory accumulation by Interprovincial Steel prior to commencing operation.

[b]Decline in scrap supply in good part due to the completion of the railway dieselization.

SOURCE: Canada, Department of Trade and Commerce, "Steel Scrap Generation in Western Canada," Ottawa, April, 1960, p. 11. (Mimeographed.)

Chapter IV[4] showed that the production of steel ingots in the Prairies has never reached 200,000 tons per year. It was stated above that the average tonnage of scrap which is being generated is 215,000 tons annually. At first glance, it could be assumed that more than sufficient raw material to supply the existing industry is available and that there should not be any concern to seek additional sources of raw material. There is a problem, however, because of the nature of the scrap being generated.

Scrap can be divided into two basic types; heavy and light. The heavy type of scrap is much preferred for steel making because it produces a better quality of steel. It is also more economical to use heavy scrap since it is not necessary to load the furnace as often, thereby reducing the time of the melt cycle.

Table 20 illustrates the prices of scrap steel in Eastern Canada. It can be seen that the heavy scrap brings a much better price than the various types of light scrap. It should be pointed out that the bundles shown in the table are light scrap that has been put through a preparation stage involving compression into cubes.

It has been estimated that seventy per cent of the scrap being generated in the Prairies at present is of the heavy variety. It would appear, therefore, that there is not a problem in regard to obtaining sufficient scrap of the proper type. A complication arises however, in that approx-

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[4]See Table 2.

TABLE 20

SCRAP STEEL PRICES AT POINT OF SHIPMENT, HAMILTON, ONTARIO

Brokers buying prices per net ton on cars:	
Number 1 heavy melting	$21.50
Number 2 heavy melting .... cut three feet and under	16.00
Number 1 dealer bundles	21.50
Number 2 bundles	17.50
Mixed steel scrap	11.50
Bushings, new factory, prepared	21.50
Bushings, new factory, unprepared..	13.50
Machine shop turnings	3.50
Short steel turnings	7.50
Mixed borings and turnings	4.50
Cast scrap	31.00

SOURCE: Iron Age, December 27, 1962.

imately fifty per cent of this heavy scrap is railway scrap, most of which is generated in the railway shops in Manitoba. Most of this railway scrap is shipped to Eastern Canada because it commands a better price in the eastern markets than in the Prairies.

The following quotation explains the unusual situation that governs the supply of railway scrap:

> Railway scrap commands a special premium, usually ten per cent above number one price. In addition, railway

> scrap moves on Company Service and to hold any substantial volume of it in the west would require payment of the Hamilton price plus premium less a small freight allowance (equal to railway out-of-pocket cost only). This means the Prairie mills would have to pay approximately $5.00 per ton more for railway scrap than for their present source.[5]

This would effectively raise the price of railroad scrap to between thirty-two and thirty-six dollars per ton.[6]

The quantities of scrap generated in the past are not likely to increase in proportion to the amount of industrial activity because of two principal reasons. First, much of the railroad scrap that has been generated lately comes from the scrapping of steam locomotives. Second, is the trend towards lighter weight machinery for farm and general usage. Much of the scrap that has been generated in recent years is in the form of obsolete farm machinery; machinery that often has large steel wheels in addition to a heavy frame. What has happened is that the manufacturers have found that they could design more efficient machines without using as much steel as was previously necessary.

Thus, the scrap market in the future can be expected to generate a larger proportion of light scrap. This light scrap would tend to contain many more alloying agents as the strength required in the machinery can be obtained by using alloys rather than more steel. This, in turn, adds a further

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[5]Hu Harries and Associates, Ltd. op. cit., p. 16.

[6]The average mill cost of scrap in the Prairies, from 1958 to 1962, has run between twenty-seven and thirty-one per ton. Personal interview with Mr. G. R. Heffernan, President, Peace River Mining and Smelting Co., Ltd., Edmonton, Alberta, June 7, 1963.

complication when considering the usability of this scrap for steel production.

Figure 1 illustrates the process by which steel scrap is generated in Western Canada. The diagram shows one additional scrap source that may be drawn upon for steel production; that is, the import market. This scrap would probably come from the area around Chicago as this is the closest major steel producing area to the Prairies. There appears to be some surpluses of steel scrap available in the area at present. These surpluses could be due to the increasing popularity of basic oxygen furnaces which use a lower proportion of scrap per ton of steel produced. It should be pointed out that the amount of scrap available from these outside sources is not likely to be dependable since the surpluses, which appear to be available at present, could also be the result of the relatively low level of steel production in the United States rather than from a change in the basic operations. It has been suggested that the number of basic oxygen furnaces currently being used are not sufficient to affect the amount of scrap available.[7]

Whether or not this source would be drawn upon would depend on the landed cost of the scrap compared to the cost of alternate forms of raw material. It should be realized that a source of scrap steel, such as the Chicago area, can be looked upon only as a temporary source. The reason for

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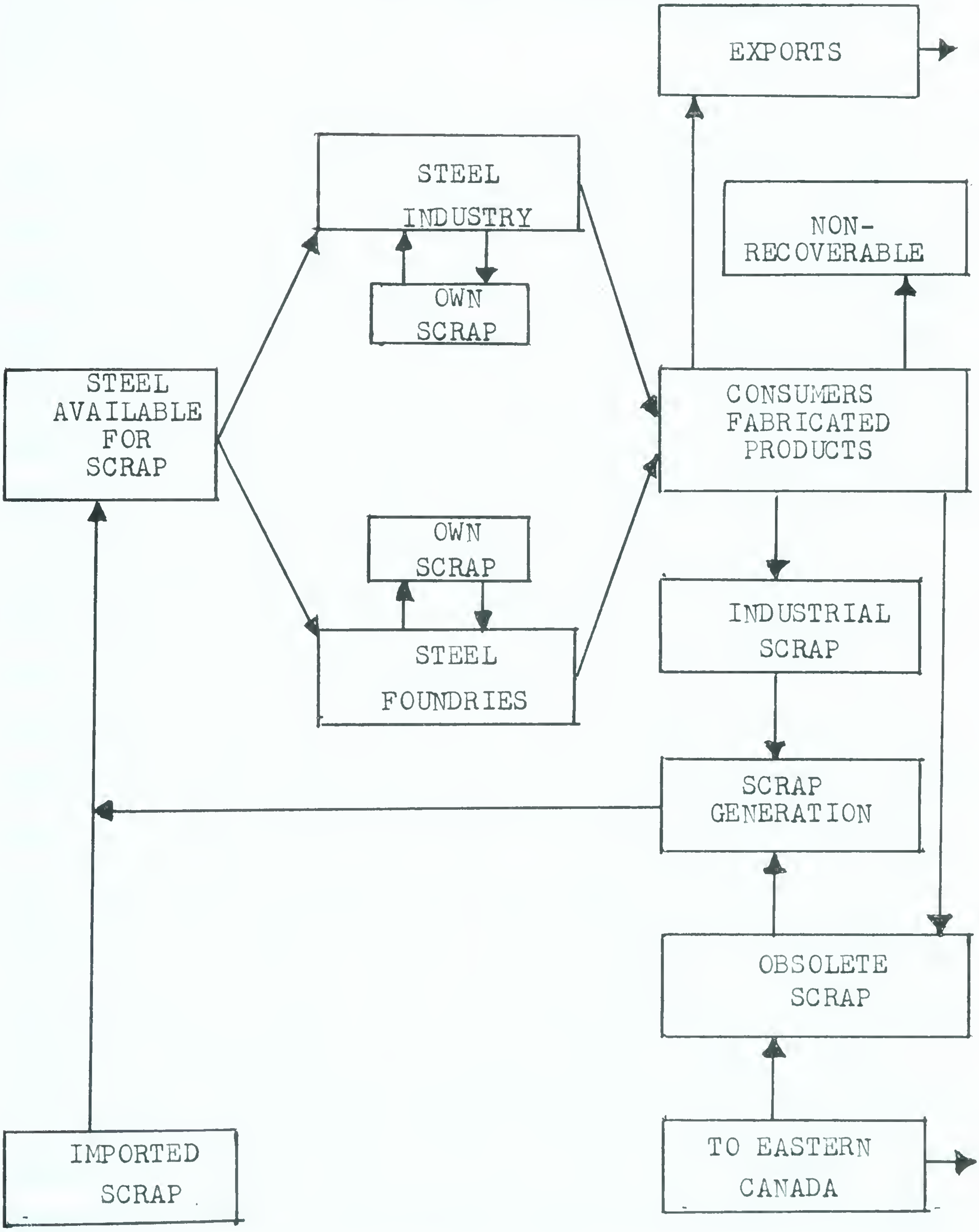
[7]Personal interview with Mr. S. W. McDermott, General Manager, Premier Steel Mills, Limited, Edmonton, Alberta, June 25, 1963.

FIGURE I

FLOW CHART OF STEEL SCRAP IN WESTERN CANADA



SOURCE: Canada, Department of Trade and Commerce, "Steel Scrap Generation in Western Canada," Ottawa, April, 1960. (Mimeographed.)

this temporary aspect is that the distance covered is almost as great as the distance the Eastern producers have to ship. This would mean that the Western producer would lose his freight advantage.

Because of the end of the dieselization process, the trend towards lighter weight farm machinery and the practice of shipping the heavy railway scrap to Eastern Canada, it must be assumed that the quantity of scrap steel being generated in the Prairies will not increase significantly. Therefore, it will be assumed that the quantity of scrap steel available for steel production will not exceed 250,000 tons annually, the present quantity being generated, in the foreseeable future. Thus, while the figures on total scrap availability are impressive, the net available scrap, scrap which Prairie producers can use for steel production, cannot be considered sufficient to support the installation of integrated facilities in the Prairies. This problem is magnified when considering the establishment of the industry in Alberta since the amount of scrap being generated at present amounts only to about 70,000 tons per year. It is unlikely that a substantial increase in supply could be found within the province since Premier Steel Mills, Ltd. is presently collecting scrap from five bailers located throughout the province. They are, in fact, obtaining close to the maximum quantity of scrap available at the present time.[8]

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[8]Ibid.

Before moving on to discuss the possibility of using iron ore as a basic raw material, the reasons why pig iron has not been considered as a basic raw material should be outlined.

Pig iron has always been in an unfavourable position in relation to scrap steel for steel production in Western Canada because of its high cost. The delivered price of pig iron at Winnipeg is in the neighbourhood of eighty dollars per ton, whereas scrap steel is available at less than thirty-five dollars per ton. The pig iron which Consolidated Mining and Smelting is producing at its plant in Kimberly, British Columbia, is selling for approximately sixty-six dollars per ton. As a result of these price differentials, pig iron is looked upon as an additive which is used to control the analysis of a melt rather than as a basic source of raw material. The only way that pig iron can be used economically for steel production is to install a large blast furnace installation so that the molten iron can be transferred to the steel making furnaces before it cools.

B. Iron Ore

The growing conviction that steel scrap generation within the Prairies will not be adequate to provide for the future needs of the steel industry has prompted a substantial amount of investigation into the possibility of using the iron ore deposits in Alberta as a possible raw

material source.

A recent study on the availability of steel scrap, referred to in the preceeding section, concluded:

> Certainly if the growth in the Prairie steel industry which has occurred in recent years is to be sustained, sources of supply other than scrap may have to be developed in the not too distant future.[9]

The iron ore resources within Western Canada are perhaps the weakest link in the raw materials chain needed for steel production. The only iron ore deposits which have been mined commercially are the magnetite deposits in the offshore islands of British Columbia. These ores contain approximately sixty per cent iron; in general, the silica content is under six per cent. They contain small amounts of lime and are of a low-phosphorus grade. In order for these ores to be used in the Prairies, they would have to be shipped to the mainland in barges where they would be reloaded into railway cars and shipped to the Prairies. Because of the multiple handling, the freight costs would be relatively high. More important than the high transportation costs is the fact that these deposits are relatively small in size and are widely scattered throughout the region. It has been estimated that the reserves do not exceed 10,000,000 tons.

After considering the above factors, it becomes apparent that the British Columbia deposits would not provide a stable base upon which to establish an integrated iron and steel industry in the Prairies, the main reason being that the size of the deposits do not ensure an

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[9] Canada, Department of Trade and Commerce, op.cit., p.12.

adequate long-run supply.

Saskatchewan has two iron ore deposits that could be considered. These are the Choiceland and Black Lake deposits in Northern Saskatchewan. Both deposits are relatively low in impurities and have a moderate iron content. The Choiceland deposit is in the form of magnetite and grades about thirty per cent iron; the Black Lake deposit is a sedimentary deposit composed largely of hematite and grades between thirty and forty per cent iron. The attractiveness offered by the low impurity content of these deposits is overshadowed by the fact that both deposits underlie 2,000 to 3,000 feet of overburden. This condition would involve a shaft type of mining operation which would cause the mining costs to be extremely high. The reserves of these deposits are assumed to be large enough to assure a long term supply.

In Manitoba, the only deposits of interest are in the Neepawa area. These deposits are basically hematite, of which the iron content generally runs about thirty-five per cent. To date, there is no indication of the size of the reserves. The main problem encountered with these deposits, as is the case with the Saskatchewan deposits, is that the overburden, a Paleozoic limestone, is some 2,500 feet thick.

There are deposits present in Montana which have been mentioned as a possible raw material source. The major problem with the Montana ores is that the developed deposits are owned by Colorado Fuel and Iron who plan to

use the deposits for their own steel production. There is little information concerning any other sources in the area.

There is a developed deposit in Northwestern Ontario at Steep Rock Lake. This deposit is of the magnetite variety and grade approximately fifty per cent iron. The problem with the Steep Rock ores, in respect to an Alberta based plant, is that they are 1,200 miles away. The resulting transportation costs would tend to preclude the use of these ores in Alberta. The reason for this assumption is that the Eastern steel mills in Sault Ste. Marie are not much further away from the Alberta market. Therefore, the long haul on the raw materials would tend to eliminate the freight advantage enjoyed by the Alberta producer. This would mean that the Alberta producer would have to compete on an equal footing with the larger Eastern mills, a situation which is not feasible due to the difference in the size of the two operations.

Alberta possesses two sedimentary iron deposits of potential economic significance. The first of these is the Burmis and Dungarnin deposit which is located in the Crowsnest Pass area. The deposit contains an iron content of approximately forty-four per cent. In addition to this, the deposit contains a silica content of about nineteen per cent and a titanium content of 8.5 per cent, both of which detract from the economic value of the deposits due to the difficulty of removal during the beneficiation stage. The deposit contains approximate reserves of 10,000,000

tons of ore. The size of these reserves is perhaps the main drawback to the development of the deposit since the potential output is limited to 5,000,000 tons of iron which cannot be considered an adequate long-term supply. There does not appear to be any problem with the overburden because the ore is within twenty feet of the surface in most places.

The second iron ore deposit in Alberta, which is the Clear Hills deposit in the Peace River area, merits more discussion than given the previous deposits because of the large reserves present. The potential of the Clear Hills iron ore deposit was not recognized until 1953 when the cuttings of a capped gas well were analyzed by the Research Council of Alberta.[10] Following this, a prospecting permit was issued to Mr. D. B. McDougall who carried out further tests. From these tests, he concluded that the deposit contained approximately one billion tons of ore, grading thirty to thirty-five per cent iron.

In 1955, Premier Steel Mills Ltd. obtained leases and permits for exploration of the Clear Hills and Worsley deposits. The company engaged in an extensive exploration program, the results of which confirmed the existence of huge reserves or iron ore, grading between thirty to thirty-five per cent iron.[11]

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[10] C. S. Samis and J. Gregory, "The Reduction of Clear Hills Iron Ore by the R - N Process," Information Series No. 40; Research Council of Alberta, 1962. (Mimeographed.)

[11] Reports prepared in 1960 and 1961 by N.S. Edgar indicate that the Worsley area on the southern edge of Clear

The problem of overburden is minimal in that the ore is within ten feet of the surface and what overburden there is consists of a soft galcial deposit that can be easily removed by a bulldozer.[12]

The Clear Hills iron ore deposits have transportation facilities within easy reach. Both the Northern Alberta Railway and the Pacific Great Eastern Railway have lines within twenty miles of the deposits. In addition to the transportation facilities, the ore body is ideally located in respect to fuel as the Worsley gas field borders the deposit.

The foregoing discussion would seem to indicate an acceptable source of raw material for an integrated iron and steel industry located in the Province of Alberta. However, the nature of the impurities present in the ore presents a serious problem when considering the ore for steel production. Petrological examination of the deposit indicates that both texturally and minerallogically, the ore is so complex that physical beneficiation of the ore is almost impossible.[13]

Hills contains about 34,000,000 tons grading thirty-three per cent iron and the Swift Creek area north of the Clear Hills contains about 200,000,000 tons grading thirty-four per cent iron. Ibid.

[12]Exploratory surveys have indicated that the depth of the overbruden is approximately five to ten feet. Therefore bulldozers or road-grading equipment could be used to remove the overburden prior to the actual strip mining process.

[13]Physical beneficiation involves an upgrading of the iron content of the ore through the removal of impurities without changing the chemical structure of the basic material. The general procedure that is followed is to crush the ore

The major difficulty in upgrading this ore by conventional means results from the chemical configuration of its high silica content and to a lesser extent, the high phosphorous content.[14,15]

The problems associated with the chemical composition of the ore have prompted a great deal of metallurgical research on the part of both Premier Steel Mills Ltd. and the Research Council of Alberta. Inasmuch as physical beneficiation cannot upgrade the ore to be suitable for blast furnace charge, other methods for reducing the iron ore have been examined. As a result of these investigations, the R-N Process[16] was considered most promising. It was decided to test the Clear Hills iron ore at the R - N Corporation plant at Birmingham, Alabama. Approximately 5,000 tons of

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and then put the ore through a roasting process to drive off some of the impurities; the iron can then be removed by magnetic separation.

[14]It has been reported that the percentage of SiO_2 present in the ore amounts to twenty-seven per cent. The percentage of phosphorous present amounts to 0.675 per cent. C. P. Gravenor, G. J. Govett and T. Rigg, "A Hydrometallurgical Process for the Extraction of Iron from Low-grade Ores," Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1963, p. 6. (Mimeographed.)

[15]Kidd, D. J. (1959) Iron Occurrence in the Peace River Region, Alberta; Research Council of Alberta, Preliminary Report 59-3. Dr. Kidd states on page 28 that the phosphorous content is too high for the long established North American smelting methods but perhaps not too high for the more versatile European steel-making techniques.

[16]The R - N Process derives its name from the Republic Steel Corporation and the National Lead Company who developed the process jointly.

ore was run through the pilot plant to obtain cost estimates for production on a commercial basis. While the reports of the tests and the projected capital and operating costs of a commercial operation are confidential, the capacity of an economic unit would need to be greatly in excess of local steel requirements.[17] Hence additional export markets would need to be found.

Additional geological work subsequent to the R - N tests has shown that the greater part of the Peace River iron deposit is characterized by the presence of iron alumina-silicate minerals. Due to the low fusion point of the latter, it is probable that this type of ore is not amenable to R - N reduction. Large scale tests have not been carried out to confirm this conclusion.

At the same time as the R - N tests were being run, the Alberta Research Council was working on a process to beneficiate the Clear Hills ore by chemical means. This process is referred to as the Hydrochloric Acid Process or the Research Council of Alberta Iron Process.[18] This process dissolves the ore in hydrochloric acid and, through evaporation, crystallation and reduction, yields an iron

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[17] J. Gregory and G. J. Govett, Research Council of Alberta, private communication.

[18] Detailed descriptions of the Hydrochloric Acid Process and the R - N Process have not been included. For a full description of the processes, see C. P. Gravenor _et al._, _op. cit_. and C. S. Samis and J. Gregory, _op. cit_.

powder of high purity.

While the cost of iron powder would prohibit its use in normal steel making operations, it could be used for direct rolling of steel, in powder metallurgy and in the production of specialized iron products such as transformer cores.[19] The Research Council of Alberta process has not yet been proved as technically or economically feasible and until large scale pilot plant tests have been undertaken, it cannot be considered in any sound economic projection.

On the basis of the foregoing discussion, it must be concluded that the Peace River iron ore deposit cannot be considered as a possible source of iron ore for an integrated iron and steel industry in Alberta at the present time. Hence, a further possible raw material source will be examined, namely, iron ore from a foreign country.

Iron ore, grading approximately seventy per cent, can probably be obtained from Chile or Peru and landed in Vancouver at a cost of between eighteen and twenty dollars per ton, including unloading charges. Unfortunately, there is no way of verifying the assumed cost of the ore as there is not a movement of this kind being undertaken at present. In view of the fact, however, that iron ore from these countries is being landed on the Atlantic seaboard at an

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[19] As the purity of iron powder approaches 100 per cent, its electrical characteristics change radically. These changed characteristics lend themselves to such things as speciality electrical goods.

approximate cost of twelve dollars per ton, it can be assumed that the above estimate is reasonable.[20]

Once the ore is landed in Vancouver, it must then be shipped to Edmonton, the proposed location for the industry as outlined in Chapter IV. Once again, it becomes necessary to make an assumption regarding the transportation costs in that there is not a movement of this type taking place at present. In view of the large volume that must be moved, there would have to be an agreed charge negotiated with the railway.[21] At present, there is a commodity rate on iron ore between Vancouver and Edmonton of $1.16 per hundred pounds of a 50,000 pound minimum. If a movement of approximately 400,000 tons per year were undertaken, then there is no doubt that the above rate could be reduced substantially. One possibility would be to ship large quantities all at once so that a complete train would be used.[22] In view of the large quantity which would have to be shipped, it could be assumed that a rate

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[20]Steel, October 22, 1962.

[21]It is not possible to deduce approximately what the rate will be by using the cost of moving some other raw product over the same mileage as information concerning agreed charges in only available to the parties to the agreement.

[22]Assuming that an open railway car could hold fifty tons of ore, then a train of fifty cars would carry 2,500 tons of ore. The movement of 400,000 tons per year would involve the use of one hundred and sixty trains per year.

of fifty cents per hundred pounds would not be unreasonable.[23] This would yield an estimated ore cost in Edmonton of between twenty-eight and thirty dollars per ton. The ore would then be concentrated, in Edmonton, into electric furnace melting stock by using the Stelco-Lurgi Process[24] which would yield a pellet containing approximately ninety to ninety-five per cent iron.

The feasibility of using the foreign ore, as outlined above, will be examined in Chapter VII.

C. Summary

The average amount of scrap generated on the Prairies in recent years has been in the order of 215,000 tons per year. It has been estimated that the amount of scrap that will be available for steel production is not likely to exceed 250,000 tons per year in the foreseeable future. Therefore, if the industry, which includes Manitoba, Saskatchewan, and Alberta, develops to the point where the raw material requirements of the industry exceed 250,000 tons per year, then a source of raw material other than

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[23]In view of the fact that the railways are shipping some steel products from the Eastern steel mills to Vancouver at a price of ninety-five cents per hundred pounds, it would follow that the fifty-cent rate from Vancouver to Edmonton, on a much larger volume and on a product having a very low value per unit of weight, is not unrealistic.

[24]The Stelco-Lurgi Process is a beneficiation process which is similar in nature to the R - N Process. Rather than producing a briquette, as does the R - N process, the output is in the shape of a small pellet about one-half inch in diameter which is better suited for electric furnace operation. This process was developed by the Steel Company of Canada, Limited.

scrap must be found.

It was also shown that pig iron would not qualify as an alternative source of raw material due to the price structure of the product.

The available iron ore deposits in the Prairies are not suitable as a source of raw material for the industry at the present time.

A further possibility which was examined is the importation of iron ore from South America. The feasibility of using this ore will be examined in Chapter VII.

Before turning to the feasibility study, the reason for not following an obvious solution, which is to establish the industry in Vancouver and avoid the high transportation costs to the Edmonton area, should be clarified. The reason is that the market for the steel, specifically the majority of the pipe producers, is located in Alberta and not on the West Coast. As was shown in Chapter II, the steel industry is market-oriented and not resource-oriented.

CHAPTER VII

THE PROSPECTS FOR THE ESTABLISHMENT OF AN INTEGRATED IRON AND STEEL INDUSTRY IN ALBERTA

It is the purpose of this chapter to decide whether or not it would be feasible to establish an integrated iron and steel industry in Alberta.

The usual way to decide whether a project is feasible is to examine the proposed revenues and costs of the project and then determine whether the resulting profit or loss warrants undertaking the project. The decision of whether or not it would be feasible to establish an integrated iron and steel industry in Alberta cannot be decided by using the above approach because there is not any method for obtaining reliable estimates of the operating costs. The reasons for this situation will be outlined in the section dealing with operating costs.

What will be done is to examine the location, markets, and other relative aspects of the industry in Alberta and then indicate whether or not an integrated industry is likely to be set up at the present time.

A. Plant Location

In Chapter II, it was shown that the decision to

establish an integrated iron and steel industry should be based upon proximity to the market. Therefore, if such an industry were to be established in the Prairies, it would follow that the most suitable location would be the one that is closest to the market. In Chapter IV, it was shown that the majority of the steel being consumed in the Prairies is consumed in Alberta. In 1961, the estimated consumption ratio was 10.5 / 1.5 / 3.0 for Alberta, Saskatchewan and Manitoba respectively.[1]

Up to this point, it has been established that Alberta consumes a greater quantity of steel than either of the other provinces. This factor alone could be used to justify Alberta as the proposed location. Further justification for choosing Alberta can be found in the fact that the majority of the Prairies' pipe producing facilities are located in Alberta. This is an important factor in that the establishment of an integrated iron and steel facility, in the Prairies, would have to be based upon the provision of skelp for pipe production.[2]

The above discussion establishes the reasons for choosing Alberta as the location of the proposed industry. Now the second part of the assumption must be justified; that is, the choice of Edmonton as opposed to any other centre in Alberta.

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[1]See Chapter IV.

[2]See the section on the oil and gas industry in Chapter IV.

It is assumed that the industry would not start from scratch but would be established as the result of an expansion of the existing facilities of Premier Steel Mills, Ltd. The reasons for this assumption are twofold. First, Premier Steel has a captive market for skelp in Camrose Tubes Limited, as the Steel Company of Canada, Limited - the parent company of Premier Steel - owns a half interest in Camrose Tubes. The second reason is simply that Premier Steel is wholly owned by Stelco. This provides Premier Steel with access to funds for expansion purposes and, of perhaps greater significance, provides access to technological information and experience.

From the above discussion, it would appear that the most logical organization to undertake the establishment of an integrated iron and steel facility in the Prairies would be the Steel Company of Canada through its wholly owned subsidiary, Premier Steel Mills, Ltd. In accordance with this conclusion, Janes and Elver state:

> Should an integrated steel facility be established on the Prairies, it seems that the most practical location would be in the Edmonton, Alberta area because the market for flat rolled products is strongest there. This is so because of the concentration of the oil and gas industries in Alberta and northeastern British Columbia, a concentration that is expected to become even more pronounced. Also important is the fact that a large portion of pipe production capacity is near Edmonton and, hence, the area presents the largest outlet for skelp. Further support for this location is provided by the recent acquisition of Premier Steel Mills Limited's steel plant at Edmonton by the Steel Company of Canada Limited, and the latter's participation in Camrose Tubes, Limited,

the largest pipe manufacturer in the Prairie Provinces.[3] The above quotation tends to confirm the conclusion brought forth in Chapter II that the location of a steel industry must be based upon market-orientation rather than resource-orientation.

B. Composition of Output

There are two basic types of production which would be undertaken by the integrated iron and steel facility; merchant bar production and flat rolled or skelp production.

The merchant bar production would be the same type of production that Premier Steel is involved in at present. There could be an expansion of the quantities that are produced to meet the expansion of the market. However, an expansion of the size ranges is not likely as the market would not warrant the expenditure on the additional rolling mill facilities that would be necessary. It is known, for example, that light structurals are currently being produced in the form of small angles, et cetera, on the merchant bar mill at Premier Steel. To consider expanding this production so as to be able to produce the medium and heavy structurals is out of the question in view of the large capital outlays necessary.[4] There also does not appear to be any justification

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[3]T. H. Janes and R. B. Elver, "The Steel Industry of the Prairie Provinces", Paper presented at the Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Edmonton, Alberta, April 1, 1964, p. 13. (Mimeographed.)

[4]One of the major steel companies, Algoma, has only recently installed a mill capable of producing the heavier structurals. This is the only mill in Canada capable of such production, and is of sufficient size to supply the whole Canadian market.

for the establishment of facilities capable of producing cold rolled sheets as the markets for this type of production, that is, automobile bodies, refrigerator cabinets, et cetera, are primarily located in Eastern Canada. Here again, the size of the market in the Prairies is not large enough to warrant the large capital expenditures necessary.

It will be assumed therefore, that the level of production of merchant bar products should range between 75,000 and 100,000 tons per year, and should remain at approximately this level for some time. As the data in Chapter IV indicates, there is not a discernable growth factor present in the consumption of merchant bar products. The lack of a growth trend is illustrated by Table 21 which was taken from the data in Chapter IV. The reason for this might be the fact that construction has been at a high level in the Prairies during the past few years which would account for the unstable consumption pattern.

TABLE 21

CONSUMPTION OF BARS IN THE PRAIRIES
FOR THE YEARS 1956 TO 1961

Year	Tons
1956	113,430
1957	86,651
1958	85,292
1959	112,928
1960	98,022
1961	125,264

SOURCE: Taken from Table 1.

In view of this unstable pattern, it is more realistic to assume that the future consumption of merchant bar products will remain at a relatively constant level rather than to introduce a growth factor. It is further assumed that the market for merchant bar products will not expand beyond the geographical limits of the market currently held by Premier Steel in that merchant bar products are low value per unit of weight and consequently cannot absorb substanial transportation costs. It is assumed that the quantity of merchant bar production will be 90,000 tons annually.

The second basic type of production is that of flat rolled or skelp production. As will be shown presently, this type of production requires a different type of rolling mill facilities than does merchant bar production.

Skelp is broken down into three basic size ranges which are shown in Table 22.

TABLE 22

STANDARD SIZE CLASSIFICATIONS FOR SKELP

Pipe Size (inches)	Skelp Width (inches)
0 - 4	0 - 14
4 - 16	14 - 48.6
16 - 42	48.6 - 140.0

SOURCE: Taken from Table 8.

If the local industry decided not to produce the full range of skelp for pipe production due to high capital costs for installation of equipment necessary to produce the wider sizes, it has been estimated that production of skelp up to 73.2 inches in width (pipe diameter of twenty-four inches) would be sufficient to supply half the tonnage required for the transmission lines.[5] This may prove to be an advantage as the larger sizes are used primarily for major pipeline projects, the construction of which has tended to vary considerably in recent years, as was shown by Table 10. Assuming that this width of skelp would be adequate to supply the needs of the other forms of pipe such as gathering, distribution, and well casing, the approximate tonnage which the integrated facility would attain would be between 200,000 and 225,000 tons per year.[6] The main reason that the consumption of the smaller diameter pipe tends to be more stable than the large diameter is that the small diameter pipe is consumed by a wide variety of industries and commercial uses, whereas the large diameter pipe is only used in the construction of transmission lines.

At this point, it is necessary to point out that these production estimates are hypothetical and relate to

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[5]Janes and Elver, op. cit., p. 21.

[6]The average tonnage of pipe consumed in the Prairies between 1956 and 1961 was 389,092 tons per year. The consumption ranged between 255,999 and 655,080 tons per year. These figures do not include any oil well casing or production casing. See Chapter IV.

the market potential only, and not to the way in which any particular firm is likely to respond to the market possibilities.

In assessing the value of the proposed output of the integrated iron and steel facility, it is not possible to calculate the prices of the products on a detailed basis as the product mix will change within the basic categories. What can be done is to use an average price-per-ton for the basic categories which will yield an estimate of the value of the products produced. The average prices-per-ton were arrived at through consultation with a sales representative from the Steel Company of Canada, Limited.[7] He stated that the average selling price, f.o.b. Edmonton, for merchant bar products is in the range of $6.35 to $7.50 per hundred pounds, or $127.00 to $150.00 per ton. The price of skelp, f.o.b. Edmonton, ranges between $7.20 and $8.00 per hundred pounds, or $144.00 to $160.00 per ton, depending on the size range. For purposes of evaluation, it is assumed that the selling price of merchant bar products is $130.00 per ton and that skelp will sell for $150.00 per ton as this is the average price for the middle size ranges, fourteen to seventy-two inches in width.

By using the above prices and quantities, the estimated sales of the integrated iron and steel facility would

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[7]Personal interview with Mr. D. Farrell, Sales Representative, Premier Steel Mills, Limited, Edmonton, Alberta, July 8, 1963.

amount to $43,200,000.[8]

Before turning to the cost side of the profitability study, a possible market that may consume additional tonnage should be mentioned. As was pointed out earlier, the possibility of producing structurals for the Prairie market is not feasible because of the high capital costs incurred in the establishment of the necessary rolling mill facilities. There is a new method of producing structural shapes which is to fabricate the structural from flat rolled sections rather than to roll the whole structural shape in one piece. The advantage of producing structural shapes in this manner is that the flat rolled sections can be rolled on a skelp mill, thereby eliminating the costly rolling mill facilities necessary to produce the conventional structural shapes.

The fabricated structurals are produced by welding the flat rolled sections together to form the conventional shapes such as the "I" beam and the wide flange beams. This type of production has been facilitated by the continuous welding techniques that have been developed in conjunction with pipe production.

The advantages of the fabricated structural is that the shape is not restricted to the limitations of a rolling mill. It is possible to produce a fabricated structural member equal in strength to a conventional structural member with less steel content. This is accomplished by placing

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[8] This figure is made up of 90,000 tons of merchant bar products at $130.00 per ton and 210,000 tons of skelp at $150.00 per ton.

the steel where the strength is required. In view of the reduced steel content and the elimination of the extensive rolling mill facilities necessary to produce the conventional shapes, the use of fabricated structurals probably means a reduced cost to the consumer.

As stated above, fabricated structurals may provide an additional source of tonnage for the integrated facility. Table 1 indicates that the average consumption of structurals in the Prairies, from 1956 to 1961, has been in the order of 60,000 tons per year; that is, approximately fifteen per cent of the total steel consumption. Therefore, the market potential is significant. However, because the use of fabricated structurals is still in the experimental stages in North America, it is not possible to consider this possible tonnage for the purpose of evaluating the prospects of an integrated iron and steel facility at this time. However, it can be assumed that the prospects for the attainment of a portion of this market in the future are reasonably good.

C. Raw Material, Operating, and Capital Costs.

In Chapter VI, it was shown that the Alberta producer is paying twenty-eight to thirty-one dollars per ton at the producer's plant for scrap steel. It was also shown that iron ore, grading about seventy per cent iron, could be landed in Edmonton for twenty-eight dollars per ton.

It will be assumed that the maximum quantity of scrap

available to the Alberta producer is 100,000 tons which would cost $2,800,000 using the twenty-eight dollar figure. If a ninety per cent yield is used, then this would produce 90,000 tons of finished steel rolling mill products. Therefore, the remaining 210,000 tons of finished product must be produced from iron ore. Using a ninety per cent yield once again would mean using 335,000 tons of iron ore, grading about seventy per cent iron, which would cost $9,380,000. This would yield a total raw material cost of $12,180,000, or $40.60 per ton of finished steel rolling mill product.

The main stumbling block in arriving at a specific cost per ton for the finished product is the lack of information concerning operating costs; that is, the cost of converting the raw material into finished steel products. There are two reasons for this lack of information. First, each steel plant is a custom-made installation, therefore cost data from one plant would not necessarily be relevant to another plant; this is especially significant when comparing plants in different geographical regions due to different raw material costs, power, and fuel costs.

The second, and most important reason, for lack of information concerning operating costs, is that the various companies will not make their costs public. These costs are, in fact, closely guarded secrets and are known only to a few key personnel in a company.[9]

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[9]Personal interview with Mr. J. McKay, Research Engineering, The Steel Company of Canada, Limited, Edmonton, Alberta, February 3, 1964.

The only information which could be obtained regarding operating costs of the proposed industry was from a personal interview with the General Manager of Premier Steel Mills, Ltd. He estimated that the operating costs, in a region such as Edmonton, to produce the proposed output would be approximately eighty to ninety dollars per ton.[10] The adequacy of this estimate will be discussed in the conclusion of this chapter.

The estimated capital investment in plant and equipment necessary to produce the proposed output is $23,000,000. This figure is made up of $5,000,000 representing the replacement value of the existing plant and equipment at Premier Steel Mills Ltd., and $18,000,000, representing the proposed additional facilities required to produce the skelp output.[11]

It is assumed that the proposed capital investment in plant and equipment would be financed with equity capital because these items are of a permanent nature.

The proposed additional installation would require the following basic items:

(1) Two thirty-two ton electric furnaces, plus soaking pits.

(2) Ninety-six inch wide plate mill.

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[10]Personal interview with Mr. S.W. McDermott, General Manager, Premier Steel Mills, Ltd., Edmonton, Alberta, July 30, 1963.

[11]The existing equipment at Premier Steel Mills, Ltd. was described in Chapter III. The $18,000,000 additional installation is based upon a quotation prepared for Premier Steel in 1959.

(3) Seventy-two inch wide skelp mill.

(4) Forty-ton bloom furnace.

(5) Stelco-lurgi beneficiation equipment.

(6) Additional rail and yard development.

The above description of the basic components of the proposed installation may appear to be somewhat contradictory in that there is included a ninety-six inch plate mill in addition to the skelp mill. The reason for having both mills is that the plate mill reduces the steel into a form which can pass through the skelp mill.

Before discussing the remainder of the capital investment, it should be emphasized that the inclusion of rolling mill facilities capable of producing the wider ranges of skelp, that is over seventy-two inches in width, are not being considered as the capital outlay that is required is far beyond the scope of the Prairie market.[12]

In addition to the investment in plant and equipment, provision must also be made for investment in accounts receivable and inventories. This is because a certain level of inventories and accounts receivable must be maintained so long as the business is in operation; consequently, these items must also be financed with equity capital. Based upon sales of $43,200,000 annually, and with credit terms of thirty to forty days which is the present custom in the industry, an investment of $4,000,000 would be required

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[12]The 148-inch plate mill which the Steel Company of Canada, Limited is presently installing in their Hamilton Works plant costs in excess of $60,000,000.

for the accounts receivable. In the case of inventories, additional provision of $3,000,000 would be sufficient as it is usual for skelp production to be undertaken upon receipt of an order rather than produce for inventory. When the provision for accounts receivable and inventories is added to the investment required for plant and equipment, it is found that the amount of equity capital needed to finance the industry is $30,000,000. This is the investment upon which an adequate return would be calculated.

After a discussion with the Secretary-Treasurer of Premier Steel Mills, Ltd.,[13] it was decided that an adequate return on the capital investment in such a project would be ten per cent, after provision for taxes.[14] This means that, based on a capital investment of $30,000,000, provision for approximately $6,000,000 must be made from the total revenue in order to obtain this return.

The remaining cost factor which must be considered is depreciation. The depreciation would be applicable to the plant and equipment only, the value of which was estimated at $23,000,000. The maximum rate allowed by the federal government is twenty per cent on the reducing balance. This would approximate a straight line rate of ten per cent per year. This latter rate will be used as it provides a consistent comparison from year to year.

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[13]Personal interview with Mr. W. K. Grundy, Secretary-Treasurer, Premier Steel Mills Ltd., Edmonton, Alberta, July 29, 1963.

[14]The rates applied to corporation profits in Canada are: twenty-one per cent of the first $35,000 and fifty per cent on the remainder.

TABLE 23

ESTIMATED PROFIT AND LOSS STATEMENT FOR THE PROPOSED IRON AND STEEL INSTALLATION

Revenue		Total Costs	
Sales	$43,200,000	Iron Ore	$ 9,380,000
		Scrap	2,800,000
		Operating Costs[a]	25,500,000
		Depreciation	2,300,000
			39,980,000
		Net Profit before taxes	3,220,000
Total Revenue	$43,200,000	Total Costs	$43,200,000

[a]A figure of eighty-five dollars per ton was used in calculating the operating costs.

Table 23 illustrates the profit and loss statement which would result from using the above costs and revenues. The resulting profit, before taxes, is considerably short of the adequate return which was discussed previously. The return received approximates the return which can be obtained from government bonds. This return would seem to indicate that the investment opportunity is not attractive enough to warrant establishing the integrated industry in Alberta at this time.

It must be realized that the above conclusion is based on a general estimate of what the operating costs of

the proposed industry are likely to be. Therefore, the conclusion can be considered reliable only to the extent that the operating costs are considered reliable. The only way to assess the reliability of the operating costs is to conduct a detailed engineering study of all phases of the operation; a study which is not within the scope of this thesis.

If the competitive position of the proposed industry is examined in relation to the larger installations in Eastern Canada, then it would appear that it is not feasible to establish an integrated iron and steel industry in Alberta at present. The basis for this statement is the raw material costs which the proposed industry would incur in the production of steel.

The estimated raw material cost, as shown above, amounted to $40.60 per ton of saleable steel. The relation to the price of scrap which Premier is using at present, that is, twenty-eight to thirty-one dollars per ton, the estimated raw material cost represents approximately a thirty-five per cent increase in cost.

The proposed output for the industry was made up of approximately sixty-six per cent skelp and thirty-three per cent bar products. It was shown in Chapter V that the freight costs on skelp from Eastern Canada to the Alberta market amounted to nineteen dollars per ton. Therefore, the Prairie producer has a nineteen dollar per ton margin to work with.

In Chapter VI, it was estimated that the probable cost of shipping iron ore, grading seventy per cent iron, from Vancouver to Edmonton would be ten dollars per ton. Using the yields outlined earlier in the Chapter means that the freight cost per ton of finished steel would amount to seventeen dollars, an amount which would almost offset the freight advantage enjoyed by the Prairie producer. This is not a feasible situation in that the very existence of the Prairie producer is dependent on his having the freight advantage over the larger more efficient Eastern producer.

In view of the size of the margin which the Prairie producer has on skelp, that is, nineteen dollars per ton, it would appear that the raw material costs would have to be in the neighbourhood of thirty dollars per ton, that is, the current scrap steel cost, in order for the proposed industry to be a profitable venture.

Further confirmation for this conclusion can be illustrated by the fact that the Eastern producer is paying approximately $21.50 per ton for scrap steel at point of origin, and eleven dollars per ton for Mesabi iron ore, grading about fifty per cent, at the lower lake ports. Using thses figures, a thirty dollar per ton of finished steel raw material cost would appear to be realistic. Therefore the Western producer is paying ten dollars per ton more for his raw material than is the Eastern producer. It must be realized however, that the iron ore that is being used to increase the present output of the industry,

would actually cost forty-five dollars per ton of finished steel. This again eliminates a major portion of the freight advantage which the Western producer enjoys.

It would appear that the only hope of obtaining a suitable source of raw material for the industry lies in the Clear Hills iron ore deposits. What must be done is to develop a process that will render a product suitable as an electric furnace charge at a price, f.o.b. Edmonton, that is equivalent to a raw material cost per ton of saleable steel of thirty to thirty-five dollars per ton.

D. Conclusion

At present, the iron and steel industry in the Prairies is wholly dependent on the scrap steel which is generated within the region as the basic raw material for steel production. From this scrap the industry produces steel products which are generally of a low value per unit of weight and are, therefore, relatively expensive to ship over a long distance. Because of this condition, the Western steel producer has been able to compete with the larger and more efficient eastern steel mills due to the natural protection afforded by the freigh rate structure which exists in Western Canada. Because of this situation, there has developed, although small by comparison, a profitable steel industry within the region.

As a result of increased industrial activity within the region, particularly in the oil and gas industry, there exists a market for primary iron and steel which is sub-

stantially larger than the output currently being produced by the industry. More specifically, the provision of skelp for pipe production provides an opportunity for expansion of the basic industry.

Unfortunately, the basic raw material, upon which the industry is dependent, does not permit a major expansion of production as the quantity of scrap currently being generated within the region is approaching its limit. This means that any major expansion program would have to be dependent upon some other source of raw material.

From the examination that was carried out it Chapter VI and from the results of the feasibility study that was conducted in this chapter, it would appear that there is not a suitable source of raw material available at the present time, the major consideration being that the landed cost in Edmonton is too high. The future of the industry depends therefore, upon the furtherance of research into improving beneficiation processes, and upon further exploration of the northern part of the province. These activities are being carried out by the various government agencies and by the research departments of the larger steel companies in Canada and the United States.

In conclusion, it would appear that all of the conditions required for a major expansion of the iron and steel industry in Alberta are fulfilled except for the availability of a suitable raw material. Therefore, the future of the industry is not contingent upon the market but rather, it is contingent upon the development of a suitable raw material source.

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